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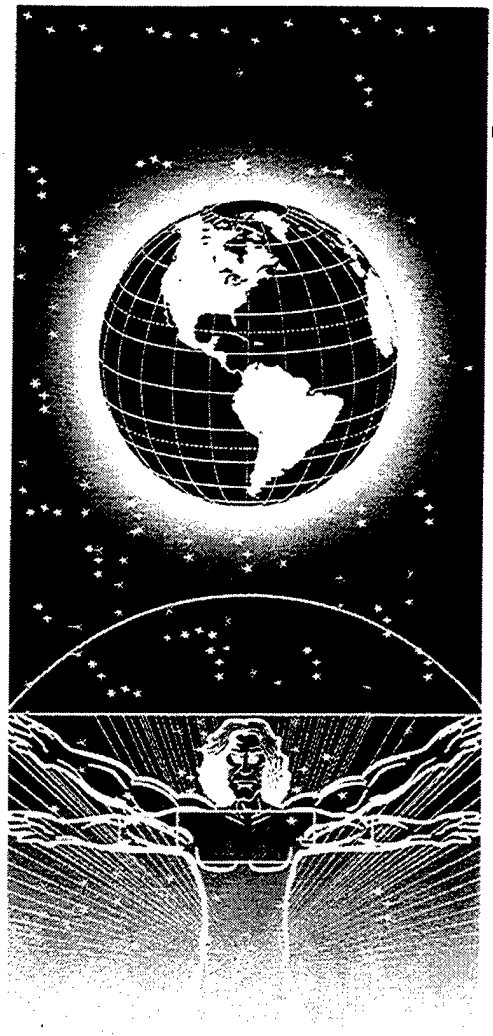

UNITED STATES AIR FORCE
IERA

Historical Air Emissions Estimate, Kelly Air Force Base, TX

Kelley Dennison

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110 Broadway, Suite 320
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March 2000

Air Force Institute for Environment, Safety and Occupational Health Risk Analysis
Risk Analysis Directorate
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13. ABSTRACT *(Maximum 200 words)*

Earth Tech was tasked to collect and analyze historical emissions data from Kelly Air Force Base (AFB), TX. They were limited in scope of work to certain years (1970 to 1975 and 1983 to 1989) with the assumption that these were "peak production years" for the support of military actions in Southeast Asia and increased defense activities, respectively. These years would give a "worst case" scenario of the air emissions at Kelly AFB. Earth Tech was also limited in scope of work to specific Air Force industrial processes (jet engine testing, painting, depainting, and degreasing). These industrial processes included the following air pollutants: benzene, toluene, ethylbenzene, xylene, methylene chloride, methyl ethyl ketone, perchloroethylene, components of burned jet fuel (cadmium, chromium, formaldehyde, benzene, arsenic, and 1,3-butadiene), and metals as applicable to painting, depainting, plating, and degreasing operations (to include cadmium and chromium). Based on the data that was analyzed, Earth Tech concluded that the data from the 1980s is the best available data to use for modeling purposes, specifically 1984, 1985, and 1986. Data from the 1970s is often sketchy, and although the confidence levels are the same for the 1970s data as the 1980s data, the 1970s data contains more uncertainty due to the extensive assumptions that were used when reviewing the data. Earth Tech recommends modeling the data using the Tier 1 approach. The Tier 1 analysis is the first part of an EPA three-tiered modeling process, defined in EPA-450/4-92-001, A Tiered Modeling Approach for Assessing the Risks due to Sources of Hazardous Air Pollutants.

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Introduction

The Agency for Toxic Substances and Disease Registry (ATSDR) was petitioned by the late congressman Frank Tejeda to perform a public health assessment (PHA) of neighborhoods north and southeast of Kelly AFB because of resident health concerns. ATSDR's PHA report dated September 9, 1999 indicated that there was evidence that residents north and southeast of Kelly AFB "are not currently exposed to levels of contaminants from Kelly AFB that would cause people to become sick." ATSDR concluded in the PHA that, "there is evidence that past air emissions may have been greater (than) current air emissions." However, ATSDR did acknowledge that there was not enough information about past levels of air emissions to determine if there was a public health hazard. ATSDR determined that past air emissions were "indeterminate" due to lack of information.

Background and Scope

Earth Tech was tasked under Contract Number F41624-95-D-9016, Delivery Order 0049 to collect and analyze historical air emissions data from Kelly Air Force Base (AFB), TX in accordance with the Air Force Institute for Environment, Safety, and Occupational Health Risk Assessment (AFIERA) Directorate Statement of Work (SOW) dated 7 February 2000.

Earth Tech was limited in scope of work to certain years (1970 to 1975 and 1983 to 1989) with the assumption that these were "peak production years" for the support of military actions in Southeast Asia and increased defense activities, respectively. These years should give the ATSDR a "worst case" scenario of the air emissions at Kelly AFB. Additionally in the PHA report, the ATSDR commented that the past air emissions were indeterminate and included as possible contaminants volatile organic compounds (VOCs), fuel, and metals from industrial processes and aircraft. Given these conclusions, Earth Tech was limited in scope of work to specific Air Force industrial processes (jet engine testing, painting, depainting, and degreasing). These industrial processes included the following air pollutants: benzene; toluene; ethylbenzene; xylene; methylene chloride; methyl ethyl ketone (MEK); perchloroethylene; components of burned jet fuel (cadmium, chromium, formaldehyde, benzene, arsenic, and 1,3-butadiene); and metals as applicable to painting, depainting, plating, and degreasing operations (to include cadmium and chromium). Finally in order to best model past air emissions, Earth Tech was asked to provide emission stack heights, or if no stack heights were available, building heights, as well as hours of operation, and emission control efficiencies as applicable.

Earth Tech employed Texas Environmental Action and Management, LLC (TEAM) as a subcontractor to recommend how to appropriately utilize the data to model emissions, and describe uses and limitations of the modeling. TEAM was selected because of their relevant related experience, including air emissions estimating and air emissions modeling. Additionally, TEAM reviewed all of the data gathered from the bioenvironmental engineering casefiles including AF Forms 2761 (Hazardous Materials Inventory) and industrial hygiene area sampling information to best estimate air emissions from certain processes. TEAM's report can be found in Appendix B of this report. TEAM's air emissions estimates can be found in Appendix D. Because of the varying data sources, TEAM's estimates may differ from Earth Tech's with regard to presentation and calculations.

Because of the potential for spurious and inferred data, Earth Tech was asked to provide assumptions regarding the certainty of the data as to high, medium, or low confidence levels. Explanations regarding the method used to estimate the certainty of the data is discussed below.

Data Collection

Data collection activities were conducted from October 12, 1999 through January 28, 2000 and consisted of information gathering, consolidation, and interviews with current and former employees.

Information Gathering

Prior to 1989, Kelly AFB Bioenvironmental Engineering Services (BES) led the assessment of the base's air emissions inventories. Earth Tech examined over 500 BES casefiles (workplace hazard assessments) at the Kelly AFB BES office for information regarding stack testing, air emissions inventories, air sampling, and Texas Air Control Board (TACB) air permitting data. Information regarding chemical use (found on AF Forms 2761) was also gathered, as well as any production information, hours of operation, and operational information. Additionally, Earth Tech gathered some information at the Air Quality Branch of the Air Force Institute for Environment, Safety, and Occupational Health Risk Analysis (AFIERA) at Brooks AFB.

Telephone Contacts

Kelly AFB Environmental Management (Kelly EM) provided Earth Tech with points of contact (POCs) at the following Workcenters:

1. Jet Engine Testing at building 655 (LP)
2. Building 360
3. Paint operations at building 329 (LDPAA)
4. Aircraft maintenance and repair (TIP)
5. Power Systems Program Management (LD)
6. Transient alert (OS)
7. Chrome plating, building 301
8. Bioenvironmental Engineering
9. Civil Engineering (CE)
10. 433rd Air National Guard
11. Kelly AFB History Office

Outside Source Contacts

Earth Tech also contacted other entities that may have had information regarding production or processes:

1. HQ AFMC, Wright Patterson AFB, OH
2. AFIERA/Air Quality, Brooks AFB, TX
3. Warner Robins AFB, GA (Paint Shop)
4. Randolph AFB, TX (Aircraft Paint Shop)
5. Wright Patterson AFB Research Laboratory

Finally, the California Air Regulatory Board (CARB), the Aircraft Environmental Support Office (AESO) Naval Aviation Depot, San Diego, CA, and Southwest Research Institute in San Antonio, TX were contacted with regard to jet engine emissions, specifically, the speciation of JP-4 jet engine emissions.

Information that could not be gathered regarding emissions testing and process information (such as Material Safety Data Sheet or MSDS information) was gathered on the Internet. Sources on the Internet are listed in the reference section.

Other means of data collection included interviews with personnel who worked at Kelly AFB (in the Workcenters listed above in *Telephone Contacts*) in the following disciplines: jet engine testing, chrome plating, vapor degreasing, painting, and depainting. Interviews were conducted informally and consisted of questioning the former and present workers, as well as pursuing further leads. Previous workers in buildings 258 and 259 (which were demolished in 1979-1980) provided process information regarding chromium plating and estimated stack and building height.

Earth Tech organized the data into Microsoft Excel® spreadsheets by year emitted, and provided a summary sheet that broke out emissions by decade, building, and total emissions for the 1980s. Only the 1980s data was totalled because it was the most complete data set. The spreadsheets include the building and process, chemical, and calculations in tons per year and pounds per hour of operation. Stack heights are also included where possible. Occasionally, the data reported were for a particular process rather than a building, so stack heights could not be determined.

Confidence Levels

Confidence levels were established on the best available data including assumptions made from existing data and whether the data are consistent. For instance, emission points (identifiers for exhaust or stack locations) from 1984 data did not match earlier emission points in 1975, so these could not be assigned a high confidence level. Additionally, if all criteria for a confidence level could not be met, the next lowest confidence level was assigned. The confidence level matrix is defined below:

High

- Emission points (locations of stacks) are exact
- Loss rates through evaporation and reclamation are known, not assumed
- Exact emission factors known or available
- Data gathered from actual inventory
- Stack heights are known and correspond to the emitter

Medium

- Emission points are not available, but with further study, could be determined (eg: column number is known, but could confirm through examination of construction drawings)

- Emission factors are estimated based upon current practices (eg: using JP-8 data to estimate jet engine emissions prior to 1991 that used JP-4*, and using/not using controls for chromium plating mist reduction)
- Loss rates are unknown
- Data was gathered from inventory using additional input from known processes and/or personnel interviews
- Stack heights assumed from best available data

Low

- Emission points unknown (building demolished or data is grouped by chemical)
- Emission factors are unknown or unavailable
- Loss rates are unknown or unavailable
- Data gathered solely from interviews
- Stack heights unavailable (building demolished)

Confidence levels for each emission estimate can be found on the respective spreadsheet. All of the air emissions estimates were assigned a "Medium" confidence level because of missing data, with the exception of data for buildings 258 and 259 and data for 1967. Since buildings 258 and 259 were demolished, most of the operational, emission point, and stack or building height data was from interviews or otherwise assumed. Because of these many assumptions, all data for buildings 258 and 259 are of a low confidence level. Because the data from 1967 does not include speciation information for jet engine testing it is also assigned a low confidence level.

Assumptions and Other Observations

Many of the data points were provided by the documentation reviewed; therefore, if there is no entry or "N/A" in a spreadsheet cell, it can be assumed that the data presented were already calculated. Data that were provided in tons per year were further broken down by emissions in pounds per hour. In many cases, the hours of operation were provided, but where they were not, a 5 day per week, 24 hour per day operation was assumed.

Emission points were provided only where they were documented. Earth Tech tried to assign emission points; however, when emission points for 1984 and 1975 were compared, there was very little correlation, leading Earth Tech to believe that the emission points had been changed throughout the years.

All calculations were in accordance with the AFIERA AEI Guidance document*.

Where possible, Earth Tech cross-checked data with hand-written notes, or submissions from questionnaires that were submitted to the TACB.

There was not a substantive amount of information regarding painting operations, other than total volatile organic compound (VOC) totals. Earth Tech tried to get information regarding aircraft

* JP-8 emission factors were applied to JP-4 combustion processes because JP-4 emission factors do not exist for the chemicals within scope. Personnel familiar with this process revealed that the jet engine testing process has not changed much since the 1970s.

painting operation; however, there were no records found that provided the type of paint used except for year 1986. Interviews to get this type of information proved ineffective due to the length of time that has spanned since personnel worked in this area (e.g., personnel cannot remember specific process information that far back).

Earth Tech was unsuccessful in gathering documentation regarding abrasive blasting operations because of the lack of data.

Chrome plating emissions were estimated only where original estimates were documented. Although Earth Tech had access to amounts of chromic acid used in the process, information regarding the tank surface area, amount of hard electroplating versus decorative, and the power at which the electroplating was performed was difficult to obtain because of the sole reliance upon personal memory from interviews. All of these components are used in the recommended emissions calculations; therefore, estimates from the amount of material used were not performed.

For the T-56 engine, there was some emission factors at the idle setting that were missing, so the approach setting was used.

For all solvent use (methylene chloride, methyl ethyl ketone, and toluene), it was assumed that 100% volatilization occurred because the solvents were wiped on or sprayed. For degreasing operations, 25% volatilization was assumed because perchloroethylene is used in tanks; therefore more of an enclosed process.

Where phenolic stripper was used, Earth Tech assumed that the methylene chloride in the stripper had a 60% concentration based on an MSDS.

Problems Encountered

Supporting documents were sometimes hard to find. Earth Tech could not find any information regarding speciation of emissions from jet engines using JP-4 fuel. The only information found was for criteria pollutants: particulates, oxides of nitrogen, oxides of sulfur, carbon monoxide, carbon dioxide, and total hydrocarbons.

The building heights and stack heights are listed in Appendix A, and were gathered by Earth Tech through review of air emissions inventories, Kelly AFB Civil Engineering construction drawings, and by the use of an electronic distance meter. Building and stack heights were often unavailable in Civil Engineering. Some buildings had been demolished and Kelly AFB Civil Engineering often did not have the construction drawings. Additionally it was often not possible to determine if the stack corresponded with the hazard. For example, a stack height would be useless when dealing with aircraft paint stripping with methylene chloride because the methylene chloride is not vented, but rather volatilized into the ambient air. Many stacks were nothing more than exhaust vents (i.e., over vapor degreasing tanks), and it was not possible to determine if the stack had been modified.

Interviews were conducted with POCs provided by Kelly EM. Interviews were attempted for aircraft painting; however, little information was gathered due to lack of documentation. Because these operations took place 15 to 25 years ago and the processes have changed, many people could not remember details regarding quantities of chemical used or what types of emission controls were in place. Telephone calls placed to the primary POCs listed under the "Data Collection" section were returned on a regular basis; however, phone calls made as a result of pursuing a further lead often ended with no fruitful information.

No data for one single year appeared comprehensive with regard to complete, speciated air emissions. Assumptions were made and are outlined in the previous section. Earth Tech's air emissions estimates can be found in Appendix C.

Conclusions and Recommendations

Based on the data that has been gathered and analyzed, Earth Tech concludes that the data from the 1980s is the best available data to use for modeling purposes, specifically 1984, 1985, and 1986. Data from the 1970s is often sketchy, and although the confidence levels are the same for the 1970s data as the 1980s data, the 1970s data contains more uncertainty due to the extensive assumptions that were used when reviewing the data.

In concordance with TEAM, Earth Tech agrees that this data is best modeled using the Tier 1 approach. The Tier 1 analysis is the first part of an EPA three-tiered modeling process, defined in EPA-450/4-92-001, *A Tiered Modeling Approach for Assessing the Risks due to Sources of Hazardous Air Pollutants*. Tier 1 analyses are performed when there is a question of whether or not the identified source has the potential to cause a significant impact.

Earth Tech recommends that only building heights be used for modeling because of the disparity in stack heights and the uncertainty of the locations and functions of the stacks. Additionally, Earth Tech recommends that Kelly AFB consider industrial facilities that surround the base as a potential source of emissions.

References

1. The Air Force Institute for Environment, Safety, and Occupational Health Risk Assessment (AFIERA) Air Quality Branch, Air Emissions Inventory (AEI) Guidance Manual: http://sg-www.satx.disa.mil/AFIERA/rse/airtool.htm

2. The Defense Technical Information Center: http://www.dtic.mil/

3. University of Vermont Safety Information Resources, Inc. (SIRI): http://siri.uvm.edu/msds/

4. California Air Resources Board: http://www.arb.ca.gov/homepage.htm

5. Environmental Protection Agency, *Compilation of Air Emission Factors*, Fifth Edition, Volume 1: http://www.epa.gov/ttnchie1/ap42.html

6. Gratt, Lawrence B., *Toxic Risk Assessment and Management*, 1996, Von Nostrand Reihnold

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APPENDIX A
BUILDING AND STACK HEIGHTS

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Kelly AFB Building/Stack Heights
Page 1

Bldg #	Bldg Ht	Drawing Date	Notes
258	20 (est.)	N/A	Building demolished early 1980s. Est. based on interview
259	20 (est.)	N/A	Building demolished early 1980s. Est. based on interview
295	20.97'		
296	12.34'		
300	20.35'		
301	32.42'		Separate exterior exhaust stacks 44.75' ; beside facility
302	12.48'		
305	27.33		
306	13' 10"	Feb-42	
308	65'	Jun-51	Exhaust vents @ 30' height
309	23.41'		
310	47' 6"	Oct-92	
312	60.08'		
313	13'		
315			No map available; facility not located
320	24.63'		
321	26.68'		
322	17.41'		
323	16' 3"	Feb-43	
324	53.27'		
325	29.08'		
326	31'		
328	19.80'		
329	41.74'		Height includes 6 exhaust vents
333	36.59'		Height includes several exhaust vents
338	17' 6"	Jan-82	
339	27.55'		
340	20' 5"		
342	13.91'		
345	26.16'		
346	15'		
347	21'		
348	30'		
348A	16.97'		
351	26.57'		
352	29.36'		
355	8.03'		
356	92'		
357	14.50'		
360	57.63'	Mar-81	Height includes 2 vent grills (4.5' x 4.5')
361	109' 6"	Jan-94	
363	47'		
364	8.53'		
365	110' 5"	Sep-70	
366			Facility demolished
370	25'	Apr-91	
374	15.5'		
375	87'	Mar-53	
376	56'		

Kelly AFB Building/Stack Height
Page 2

Bldg #	Bldg Ht.	Drawing Date	Notes
377			No map available; facility not located
385	14' 10"	Sep-82	
389	8.03'		
391			No map available; facility not located
392	34' 6"		
394			No map available; facility not located
397	40.79'		
645	30'	Sep-55	2 circular fans / 5' high
647	29.36'		
650	54'	Feb-58	
651	41' 6"	Jun-51	Exhaust system mid-roof
652	50.28'		
654	9.96'		
655	51.17'		
892			No map available; facility not located
914	11'		Building height 15' with 5 circular vents
918	13.49'		
919			Facility 919 not located
920	15.11'		
926			Facility 926 not located
929	11.93'		
930	25.33'		
1147	26.80'		
1149	24.34'		
1150			Facility 1150 not located
1151	31' 6"	May-73	Rectangular stack 1' high/20' wide
1153	10.68'		
1155	32.46'		
1156			No map available; facility not located
1160	106'		
1414	10' 6"	Jan-85	
1416	21.22'		
1417	15.06'		
1418			No map available; facility not located
1419	12.67'		Original building 11.68' - building addition (trailer) 12.67'
1420	27.47'		
1423	16.78'		
1610	91'	Oct-40	2 ridge vents / 1' high - 30' wide
1612	37.80'		Building height includes 1 aluminum stack
1614	21'		
1637	15.64'		
1643	10.97'		
3004	26.89'		
3007	28.91'		
3008	33.81'		
3010	15.74'		
3020			Facility 3020 not located

Bldg #	Bldg Ht.	Drawing Date	Notes
3030	80.11'		
3050	20.22'		
3060	28.06'		Height includes numerous vents
3064	25.04'		
3178	26.89'		
3180	18.68'		
3221	31.89'		

Bold Numbers indicate buildings where emission information was gathered.
Non-Bold Numbers indicate surrounding buildings.

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APPENDIX B
TEAM, LLC REPORT

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HISTORICAL AIR EMISSIONS ESTIMATES
KELLY AFB, TEXAS
Contract Number F41624-95-D-0016
Delivery Order 49

Purpose: The purpose of this document is to present the results of Texas Environmental Action and Management, LLC's (TEAM) consolidation and analysis of historical air emissions data collected at Kelly Air Force Base (AFB), Texas. Specifically, TEAM was tasked to (1) review gathered data and assess any calculations and assumptions that can be made from the data as being of a high, medium, or low level of confidence, (2) provide consulting recommendations regarding the feasibility of conducting air modeling with the subject data, and (3) prepare a written summary report. The scope of the data review was limited to the following processes: jet engine testing, aircraft painting, aircraft depainting, degreasing, and chrome plating. The chemicals were limited to the following: toluene, methyl ethyl ketone, methylene chloride, perchloroethylene, xylene, and components of burned jet fuel as applicable to jet engine testing emissions (to include cadmium, chromium, formaldehyde, benzene, arsenic, and 1,3-butadiene, and metals as applicable to the painting, depainting, plating, and degreasing operations. Mr. Charles Attebery, PE and Ms. Nancy Miller, PE, who are both former Air Force (AF) bioenvironmental engineers, conducted all work in accordance with the guidance documents described in Paragraph 1.4 of the Statement of Work. TEAM utilized additional guidance documents including *A Tiered Modeling Approach for Assessing the Risks Due to Sources of Hazardous Air Pollutants* (EPA, 1992).

Background: This study of historical emissions data was made in response to an Agency for Toxic Substances Disease Registry (ATSDR) Public Health Assessment (PHA) conducted at Kelly AFB that stated, "available data on past usage or emissions for many contaminants was insufficient or not suitable for analysis. There is evidence that past air emissions may have been greater than current air emissions."

ATSDR based many of its conclusions and recommendations on air modeling conducted with 1996 data. It noted in its report that emissions air modeling uncertainty cannot be accurately quantitated, and that several sources of error exist. ATSDR also noted the rate of emission, physical location of emission, or the physical form of the chemical in emission as sources of uncertainty. It also noted that meteorological data, decay rates, deposition rates, or obstructions impact modeling results. It identified data gathering and calculations as sources of error. ATSDR specifically noted that the estimation of past emissions might contain error because it is not known how representative the selected values were.

ATSDR stated in its report that the level of exposure to contaminants from Kelly AFB remains uncertain and will remain so, due to the unavailability of past emissions data. It recommended that a method of determining potential past emissions of contaminants from Kelly AFB be identified. Based on this recommendation and public concern that Kelly AFB contributed to area health impacts, Kelly AFB issued a delivery order

(F41624-95-D-0016-0049) to EARTH TECH, Inc. (EARTH TECH) to assess historical air emissions records at Kelly AFB. The purpose of the assessment was to determine if any method of calculating or estimating potential past contaminant emissions from Kelly AFB results in data suitable for use in emissions air modeling.

Relevant background information on the Agency for Toxic Substances Disease Registry (ATSDR) mission and other useful information can be found on the Internet at URL http://atsdr1.cdc.gov:8080/HAC/pha.html.

The United States Environmental Protection Agency (EPA) agrees that air emissions models have limitations and has taken steps, through the preparation of guidance documents, to simplify air emissions dispersion analyses in the determination of health effects. EPA guidance defines a three-tier process in EPA-450/4-92-001, *A Tiered Modeling Approach for Assessing the Risks due to Sources of Hazardous Air Pollutants.* The approach is especially useful and cost effective in screening historical data, which may be incomplete, collected for other purposes, or suspect with regard to data quality. The three-tier approach is as follows:

Tier 1 Analyses: Tier 1 analysis of a stationary source (or group of sources) of toxic pollutant(s) is performed to address the question of whether or not the source has the potential to cause a significant impact. This "screening" analysis is performed by using tables of lookup values to obtain the "worst-case" impact of the source being modeled. The analysis is performed to assess both the potential long- and short-term impacts of the source. If the predicted screening impacts are less than the appropriate levels of concern, no further modeling is indicated. If the predicted screening impacts are above any levels of concern, further analysis of those impacts at a higher Tier may be desirable to obtain more accurate results.

The Tier 1 "lookup tables" have been created as tools that may be easily used to estimate conservative impacts of sources of toxic pollutants with a minimal amount of information concerning those sources. The normalized annual and 1-hour concentration tables were created based on conservative simulations of toxic pollutant sources with Gaussian plume dispersion models. In this context, "conservative" simulations use conservative assumptions regarding meteorology, building downwash, plume rise, etc.

Tier 2 Analyses: Tier 2 analysis of a stationary source (or group of sources) of toxic pollutant(s) may be desired if the results of a Tier 1 analysis indicate an exceedance of a level of concern with respect to one or more of the following: (1) the maximum predicted cancer risk; (2) the maximum predicted chronic noncancer hazard index, or; (3) the maximum predicted acute hazard index. Note that in situations where only one or two of the Tier 1 criteria are exceeded, only those analyses, which exceed the Tier 1 criteria, may need to be performed at the higher Tier. For example, if the Tier 1 analysis showed cancer risk and chronic noncancer risks to be of concern while the acute risk analysis showed no cause for concern, only long-term modeling for cancer risk and chronic noncancer risk may need to be performed at Tier 2. Tier 2 analyses are slightly more sophisticated than Tier 1 analyses, and therefore require additional input information as well as a computer for their

execution. Tier 2 analyses are structured around the EPA's SCREEN model and its corresponding documentation. The SCREEN model source code and documentation is available through the OAQPS TTN (see Appendix A in EPA-450/4-92-001).

Again, similar to the Tier 1 analysis, if any of the predicted impacts from Tier 2 are above the appropriate levels of concern, further modeling is indicated at a higher Tier.

Tier 3 Analyses: Tier 3 analysis of a stationary source (or group of sources) of toxic pollutant(s) may be desired if the results of a Tier 2 analysis indicate an exceedance of a level of concern with respect to one or more of the following: (1) the maximum predicted cancer risk; (2) the maximum predicted chronic noncancer hazard index, or; (3) the maximum predicted acute hazard index. Tier 3 analysis of a stationary source (or group of sources) of toxic pollutant(s) is performed to provide the most scientifically-refined indication of the impact of that source. This Tier involves the utilization of site-specific source and plant layouts as well as meteorological information. In contrast to the previous Tiers, Tier 3 allows for a more realistic simulation of intermittent sources and combined source impacts. In addition, results from short-term analyses indicate not only if a risk level of concern can be exceeded, but also how often that level of concern might be exceeded during an average year. Dispersion modeling for the Tier 3 analysis procedure is based on use of the EPA's Industrial Source Complex (ISC2) model, and as such utilizes many of the same techniques recommended in the "Guideline on Air Quality Models (Revised)" approach to the dispersion modeling of criteria pollutants.

To facilitate the dispersion modeling of toxic air pollutants, the EPA has developed TOXLT (TOXic modeling system Long-Term) for refined long-term analyses, and TOXST (TOXic modeling system Short-Term) for refined short-term analyses. The TOXLT system incorporates the ISCLT2 (long-term) directly to calculate annual concentrations and the TOXST system incorporates the ISCST2 (short-term) model directly to calculate hourly concentrations. Codes and user's guides for both TOXLT and TOXST are available via electronic bulletin board (see Appendix A in EPA-450/4-92-001).

Data Summary: TEAM summarized various emissions and chemical usage data gathered by EARTH TECH for the subject chemicals. The data were organized by building/process, chemical, and year/decade emitted/used, where possible. Emissions and usage records spanned almost 30 years. The majority of the data was from the 1980s, followed by 1970s data. EARTH TECH collected little 1990s data. Approximately one-half of the data consisted of "baseline" chemical usage data that was collected or verified on an annual basis by the Base Bioenvironmental Engineering Services (BES) office for the primary purpose of evaluating occupational exposures to the workers who used the chemicals. The balance of the data consisted of various sampling events ranging from area samples of specific operations to personal sampling of personnel to stack emissions sampling. No one source of data for a single shop or building spanned each decade. Data summary tables that identify the level of confidence that should be placed on data for modeling purposes are included as Attachment A.

Assessment of EARTH TECH Assumptions and Calculations: TEAM did not identify an improved alternative to the data gathering approach employed by EARTH TECH. EARTH TECH personnel collected 'best available historical usage and emissions data' from the Kelly AFB BES's industrial hygiene casefiles in its attempt to speciate bulk Kelly AFB air emissions into the subject chemicals. EARTH TECH employed a reasonable approach to calculating emissions from jet engine testing, using scarce data on *speciated* emission factors for various jet engines, estimates of test time periods, and an estimate of the number of tests conducted. The EARTH TECH approach offers the best chance of identifying and/or calculating speciated emissions for the subject chemicals and processes.

Consulting Observations, Conclusions and Recommendations:

Observations and Conclusions

- There is significantly more 'best available data' from the 1980s than from the 1970s.
- The use of trichloroethane in the 1970s appears to have been phased out in favor of methylene chloride and perchloroethylene in the 1980s.
- The 1970s data focused on trichloroethane studies and sampling.
- Summary calculations (by chemical) for the 1970s data do not appear to be a comprehensive listing of emissions (overall accuracy is low).
- Summary calculations (by chemical) for the 1980s data appear to be a comprehensive listing of emissions as verified by comparison to some Kelly AFB annual emissions estimates (overall accuracy is moderate).
- The 1980s 'best available data' appears adequate to perform EPA Tier 1 air emissions modeling, although additional data including stack height and distance of each stack to the nearest receptor needs to be collected.
- The 1970s 'best available data' appears incomplete and is not adequate to perform EPA Tier 1 air emissions modeling.
- None of the 'best available data' included in this assessment is adequate to perform EPA Tier 2 or Tier 3 air emissions modeling.
- The air emissions modeling (Tier 1) that can be conducted with the 1980s data will yield a gross approximation of exposure outside Kelly AFB boundaries.

Recommendations

- Collect or estimate stack height(s) and distance(s) from sources to the Kelly AFB boundary and other information required to perform EPA Tier 1 air emissions modeling.
- Perform EPA Tier 1 modeling for 1980s data.

ATTACHMENT A

Data Assessment Methodology: Kelly AFB BES was the source of the 'best available data' collected by EARTH TECH and reviewed by TEAM. BES is primarily responsible for identifying and evaluating occupational exposures to hazardous materials and providing necessary recommendations to ensure worker protection. BES also performs environmental monitoring, as well numerous other duties. In the past BES, produced annual Air Emissions Inventory (AEI) reports. These duties require BES personnel to maintain records of chemical usage throughout the base. In the 1970s and 1980s this data was predominately collected by visiting the workplace and performing a physical inventory of the chemicals used by the workplace. BES recorded this chemical usage information for each workplace on an AF Form 2761, *Hazardous Material Inventory.* BES then evaluated the chemical usage information and determined personal and area contaminant concentration sampling needs. Personal and area contaminant concentration sampling results are recorded on AF Form 2750, *Industrial Hygiene Sampling Data.* All chemical usage and sampling information is maintained in a casefile for each industrial workplace. Today, the majority of this information is collected using a variety of computerized material tracking systems and verified during workplace visits.

Data included chemical usage and personal/area air sampling results that spanned from the early 1970s through the early 1990s. No data for a single year appeared comprehensive with regard to a complete set of chemical usage, sampling, or AEI results. TEAM calculated annual emissions of the subject chemicals using the following assumptions:

- General chemical exposure and usage did not significantly change during either the 1980s and 1970s as 10-year groups.
- TEAM prioritized calculated and actual air emissions data contained in AEIs or casefiles as the highest quality and gave it priority if two sources of data were available for the same building during either the 1980s or 1970s.
- TEAM prioritized baseline chemical usage data as the second most reliable source of data that could be converted to an estimate of emissions by assuming a percent volatilization during use.
- TEAM prioritized personal sampling data as the least reliable source of data that could be converted to an estimate of emissions by assuming a volumetric flowrate and annual operations time period.
- TEAM assumed a standard volumetric air flow rate of 10 cubic feet per minute to convert personal air sampling results to estimate emissions for specific chemicals from personal or area sampling results.
- TEAM assumed a standard annual operations time period of one day (8 hours) per week for 52 weeks to estimate emissions for specific chemicals from personal or area sampling results.
- TEAM utilized worst case values (values resulting in the highest emission rate) when more than one set of chemical usage data of equal quality were available.
- TEAM utilized an arithmetic average where more than one personal or area sampling data were available for a specific building or operation.

- TEAM assumed that degreasing operations lead to a 25% volatilization of the degreasing chemical. It was assumed that perchloroethene (PCE) was used as degreasers in tanks or some other type of system where, ultimately, 75% of the material was disposed via some method other than evaporation.
- TEAM assumed that painting/coating operations lead to a 100% volatilization of paint/coating solvent and thinner components.
- TEAM assumed that 2.5% of coatings such as zinc chromate primer is lost through overspray during painting operations.
- TEAM assumed that the use of cleaning solvents lead to a 100% volatilization of the solvent. It was assumed that ethyl benzene, methylene chloride, toluene, and methyl ethyl ketone (MEK) was used in a manner where 100% of the material volatilized, such as aerosol or wipe on/wipe off applications.

APPENDIX C
EARTH TECH'S AIR EMISSIONS ESTIMATES

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Estimated Emissions per year

			1980s data			1970s data		
Building	Description	Chemical	Usage	Units	Estimated	Usage	Units	Estimated
258	Degreasing	Perchloroethylene				6.2	tpy	1.55E+00
259	Degreasing	Perchloroethylene				4.2	tpy	1.05E+00
301	Chemical Cleaning	Perchloroethylene	4,800.0	gal/yr	8.10E+00			
301	Degreasing	Perchloroethylene	24,000.0	gal/yr	4.05E+01			
301	Chrome Plating	Chromic Acid	40,838.0	gal/yr	2.73E+04			
301	Degreasing	Perchloroethylene	60,000.0	gal/yr	1.01E+02			
301	Degreasing	Perchloroethylene	222,750.0	lbs/yr	2.78E+01			
301	Plating	Hexavalent Chromium	Unk	Unk	4.00E-03			
301	Plating	Hexavalent Chromium	Unk	Unk	4.00E-03			
301	Plating	Hexavalent Chromium	Unk	Unk	4.00E-03			
301	Plating	Hexavalent Chromium	Unk	Unk	4.00E-03			
301	Plating	Hexavalent Chromium	Unk	Unk	4.00E-03			
301	Plating	Hexavalent Chromium	Unk	Unk	4.00E-03			
301	Plating	Hexavalent Chromium	Unk	Un	4.00E-03			
301	Plating	Hexavalent Chromium	Unk	Unk	4.00E-03			
301	Degreasing	Perchloroethylene	Unk	Unk	1.35E+02			
301	Degreasing	Perchloroethylene	Unk	Unk	2.70E+02			
310	Phenolic Stripper	Methylene Chloride	60.0	gal/mo	2.40E+00			
312	Degreasing	Perchloroethylene	275.0	gal/mo	4.13E-01			
324	Thinning Solvent	Methyl Ethyl Ketone				2.0	tpy	2.00E+00
324	Degreasing	Perchloroethylene				2.4	tpy	6.00E-01
324	Degreasing	Perchloroethylene	165.0	gal/mo	2.48E-01			
324	Degreasing	Perchloroethylene	2,825.0	gal/yr	4.77E+00			
324	Degreasing	Perchloroethylene	Unk	Unk	1.58E-01			
324	Degreasing	Perchloroethylene	Unk	Unk	5.00E-01			
329	Degreasing	Perchloroethylene				1.9	tpy	4.75E-01
329	Solvent Use	Methyl Ethyl Ketone	180.0	gal/mo	7.29E+00			
329	Degreasing	Perchloroethylene	10,230.0	gal/yr	1.73E+01			
329	Carbon Remover	Methylene Chloride	19,800.0	gal/yr	6.59E+01			
340	GTCP85-180 Engine Testing	Benzene	1,458.0	test hrs/yr	2.95E-06			
340	GTCP85-180 Engine Testing	Ethylbenzene	1,458.0	test hrs/yr	4.72E-07			
340	GTCP85-180 Engine Testing	Formaldehyde	1,458.0	test hrs/yr	4.00E-06			
340	GTCP85-180 Engine Testing	Toluene	1,458.0	test hrs/yr	8.66E-07			
340	GTCP85-180 Engine Testing	m,p-Xylene	1,458.0	test hrs/yr	4.65E-07			
340	GTCP85-180 Engine Testing	o-Xylene	1,458.0	test hrs/yr	6.46E-08			
340	GTCP85-180 Engine Testing	Benzene	1,681.0	test hrs/yr	3.40E-06			
340	GTCP85-180 Engine Testing	Ethylbenzene	1,681.0	test hrs/yr	5.45E-07			
340	GTCP85-180 Engine Testing	Formaldehyde	1,681.0	test hrs/yr	4.61E-06			
340	GTCP85-180 Engine Testing	Toluene	1,681.0	test hrs/yr	9.99E-07			
340	GTCP85-180 Engine Testing	m,p-Xylene	1,681.0	test hrs/yr	5.36E-07			
340	GTCP85-180 Engine Testing	o-Xylene	1,681.0	test hrs/yr	7.44E-08			
348	Degreasing	Perchloroethylene	Unk	Unk	5.48E-01			

Estimated Emissions per year

Building	Description	Chemical	1980s data			1970s data		
			Usage	Units	Estimated	Usage	Units	Estimated
348	Carbon Remover	Methylene Chloride	Unk	Unk	9.00E-03			
348	Degreasing	Perchloroethylene	Unk	Unk	2.13E+00			
348	Degreasing	Perchloroethylene	Unk	Unk	8.50E+00			
348	Degreasing	Perchloroethylene	Unk	Unk	5.50E+00			
351	Degreasing	Perchloroethylene	5,500.0	gal/yr	9.28E+00			
360	Paint Area	Toluene	4.0	gal/dy	5.26E+00			
360	Paint Area	Methyl Ethyl Ketone	5.0	gal/dy	6.16E+00			
360	Degreasing	Perchloroethylene				5.2	tpy	1.30E+00
360	Machine Shop	Perchloroethylene	50.0	gal/mo	7.50E-02			
360	Paint Shop	Methyl Ethyl Ketone	1,320.0	gal/yr	4.46E+00			
360	Cleaning Line	Perchloroethylene	63,085.0	gal/yr	1.06E+02			
360	Degreasing	Perchloroethylene	90,200.0	gal/yr	1.52E+02			
360	Cleaning Line	Methylene Chloride	96,250.0	lbs/yr	2.89E+01			
360	Chemical Cleaning	Perchloroethylene	Unk	Unk	3.24E+01			
361	Painting	Methyl Ethyl Ketone	1,200.0	gal/yr	1.11E+00			
361	Paint	Methyl Ethyl Ketone	3,120.0	gal/yr	2.90E+00			
365	Methylene Chloride Use	Methylene Chloride				14.6	tpy	1.46E+01
365	Solvent Use	Methyl Ethyl Ketone	550.0	gal/mo	2.23E+01			
365	Primer	Methyl Ethyl Ketone	1,200.0	gal/yr	4.05E-01			
365	Primer	Toluene	1,200.0	gal/yr	6.48E-01			
365	Solvent Use	Methyl Ethyl Ketone	1,650.0	gal/mo	6.59E+01			
365	Primer	Methyl Ethyl Ketone	1,680.0	gal/yr	5.67E-01			
365	Primer	Toluene	1,680.0	gal/yr	9.07E-01			
365	Paint	Methyl Ethyl Ketone	3,450.0	gal/yr	3.20E+00			
365	Paint	Methyl Ethyl Ketone	4,760.0	gal/yr	4.42E+00			
365	Solvent Use	Methyl Ethyl Ketone	6,600.0	gal/yr	2.23E+01			
365	Solvent Use	Methyl Ethyl Ketone	12,000.0	gal/yr	4.05E+01			
365	Painting	Methyl Ethyl Ketone	12,400.0	gal/yr	1.15E+01			
365	Degreasing	Perchloroethylene	57,000.0	gal/yr	9.62E+01			
365	Phenolic Stripper	Methylene Chloride	63,140.0	gal/yr	2.10E+02			
365	Phenolic Stripper	Methylene Chloride	88,550.0	gal/yr	2.95E+02			
365	Phenolic Stripper	Methylene Chloride	285,000.0	gal/yr	9.49E+02			
366	Thinning Solvent	Methyl Ethyl Ketone				1.0	tpy	1.00E+00
366	Solvent Use	Toluene				2.1	tpy	2.10E+00
366	Solvent Use	Methyl Ethyl Ketone	30.0	gal/yr	1.01E-01			
366	Painting	Zinc Chromate Primer	132.0	gal/yr	9.24E-03			
366	Solvent Use	Methyl Ethyl Ketone	240.0	gal/yr	8.10E-01			
366	Phenolic Stripper	Methylene Chloride	660.0	gal/yr	2.20E+00			
375	Degreasing	Perchloroethylene				1.6	tpy	4.00E-01
375	Thinning Solvent	Methyl Ethyl Ketone				2.0	tpy	2.00E+00
375	Solvent Use	Methyl Ethyl Ketone	55.0	gal/mo	2.23E+00			
375	Degreasing	Perchloroethylene	110.0	gal/mo	1.65E-01			

Estimated Emissions per year

Building	Description	Chemical	1980s data			1970s data		
			Usage	Units	Estimated	Usage	Units	Estimated
375	Solvent Use	Methyl Ethyl Ketone	1,100.0	gal/yr	3.71E+00			
375	Phenolic Stripper	Methylene Chloride	5,000.0	gal/yr	1.67E+01			
375	Phenolic Stripper	Methylene Chloride	24,710.0	gal/yr	8.23E+01			
385	Methylene Chloride Use	Methylene Chloride				9.3	tpy	9.30E+00
385	Solvent Use	Methyl Ethyl Ketone	5,000.0	gal/yr	1.69E+01			
385	Phenolic Stripper	Methylene Chloride	11,500.0	gal/yr	3.83E+01			
385	Phenolic Stripper	Methylene Chloride	24,000.0	gal/yr	7.99E+01			
385	Phenolic Stripper	Methylene Chloride	41,250.0	gal/yr	1.37E+02			
385	Phenolic Stripper	Methylene Chloride	70,525.0	gal/yr	2.35E+02			
1155	NDI	Perchloroethylene	60.0	gal/yr	4.05E-01			
1420	Solvent Use	Toluene	2.0	gal/wk	3.74E-01			
1420	Solvent Use	Methyl Ethyl Ketone	4.0	gal/wk	7.02E-01			
300 Area	Degreasing	Perchloroethylene				21.5	tpy	5.38E+00
655 Area	TF-39 Jet Engine Testing	Benzene	61.0	test hrs/yr	1.58E-05			
655 Area	TF-39 Jet Engine Testing	Ethylbenzene	61.0	test hrs/yr	8.83E-07			
655 Area	TF-39 Jet Engine Testing	Formaldehyde	61.0	test hrs/yr	6.27E-05			
655 Area	TF-39 Jet Engine Testing	Methyl Ethyl Ketone	61.0	test hrs/yr	1.63E-06			
655 Area	TF-39 Jet Engine Testing	Toluene	61.0	test hrs/yr	5.65E-06			
655 Area	TF-39 Jet Engine Testing	m,p-Xylene	61.0	test hrs/yr	1.68E-06			
655 Area	TF-39 Jet Engine Testing	o-Xylene	61.0	test hrs/yr	8.83E-07			
655 Area	TF-39 Jet Engine Testing	Benzene	120.0	test hrs/yr	3.10E-02			
655 Area	TF-39 Jet Engine Testing	Ethylbenzene	120.0	test hrs/yr	1.74E-02			
655 Area	TF-39 Jet Engine Testing	Formaldehyde	120.0	test hrs/yr	1.23E-01			
655 Area	TF-39 Jet Engine Testing	Methyl Ethyl Ketone	120.0	test hrs/yr	3.21E-02			
655 Area	TF-39 Jet Engine Testing	Toluene	120.0	test hrs/yr	1.11E-02			
655 Area	TF-39 Jet Engine Testing	m,p-Xylene	120.0	test hrs/yr	3.30E-03			
655 Area	TF-39 Jet Engine Testing	o-Xylene	120.0	test hrs/yr	1.74E-03			
655 Area	T-56 Jet Engine Testing	Benzene	483.0	test hrs/yr	8.32E-07			
655 Area	T-56 Jet Engine Testing	Ethylbenzene	483.0	test hrs/yr	1.08E-07			
655 Area	T-56 Jet Engine Testing	Formaldehyde	483.0	test hrs/yr	7.19E-06			
655 Area	T-56 Jet Engine Testing	Methyl Ethyl Ketone	483.0	test hrs/yr	2.33E-08			
655 Area	T-56 Jet Engine Testing	Toluene	483.0	test hrs/yr	4.74E-07			
655 Area	T-56 Jet Engine Testing	m,p-Xylene	483.0	test hrs/yr	5.44E-07			
655 Area	T-56 Jet Engine Testing	o-Xylene	483.0	test hrs/yr	6.56E-08			
655 Area	T-56 Jet Engine Testing	Benzene	540.0	test hrs/yr	9.30E-03			
655 Area	T-56 Jet Engine Testing	Ethylbenzene	540.0	test hrs/yr	1.21E-04			
655 Area	T-56 Jet Engine Testing	Formaldehyde	540.0	test hrs/yr	8.30E-03			
655 Area	T-56 Jet Engine Testing	Methyl Ethyl Ketone	540.0	test hrs/yr	2.60E-05			
655 Area	T-56 Jet Engine Testing	Toluene	540.0	test hrs/yr	5.30E-04			
655 Area	T-56 Jet Engine Testing	m,p-Xylene	540.0	test hrs/yr	6.08E-05			
655 Area	T-56 Jet Engine Testing	o-Xylene	540.0	test hrs/yr	6.26E-05			
Dir. of maint	Degreasing	Perchloroethylene	96,000.0	gal/yr	1.62E+02			

Estimated Emissions per year

			1980s data			1970s data		
Building	Description	Chemical	Usage	Units	Estimated	Usage	Units	Estimated
Unk	Solvent Use	Toluene	15,552.0	gal/yr	5.60E+01			
Unk	Solvent Use	Methyl Ethyl Ketone	26,016.0	gal/yr	8.78E+01			
Unk	Degreasing	Perchloroethylene	150,516.0	gal/yr	2.54E+02			
Unk	Phenolic Stripper	Methylene Chloride	238,291.0	gal/yr	7.94E+02			

Summary of estimated	Emissions	Units
Perchloroethylene	1.49E+03	T/yr
Chromium +6	4.00E-02	
Chromic Acid	2.73E+04	T/yr
Methyl Ethyl Ketone	3.05E+02	T/yr
Methylene Chloride	2.94E+03	T/yr
Benzene	4.03E-02	
Ethyl Benzene	1.75E-02	T/yr
Formaldehyde	1.31E-01	
Toluene	1.16E-02	T/yr
Xylenes	5.17E-03	T/yr

Source: "Air Pollution Emissions from Jet Engines, Feb 1967"

Bldg #	Emis Pt #	Description	Material Used	Density (lb/gal)	Quantity Used	Units	Pollutant	1967 Emissions (tpy)	Days of Operation (days/week)	Hours of Operation (hrs/day)	Emissions in lbs/hour	Controls Used	Stack Height (feet)	Notes
		J-75 Engine at 65% power					Olefins				2.60E+00			as carbon atoms
							Aromatics				2.70E+00			as carbon atoms
							Total Aldehydes				4.00E-01			as formaldehyde
		T-56 Engine at low ground idle					Olefins				7.00E-01			as carbon atoms
							Aromatics				3.00E-01			as carbon atoms
							Total Aldehydes				3.00E-01			as formaldehyde
		TF-33 Engine at idle					Olefins				4.36E+01			as carbon atoms
							Aromatics				1.19E+01			as carbon atoms
							Total Aldehydes				7.80E+00			as formaldehyde

Notes:

1. This data is from actual testing data but it did not speciate aromatics, and aldehydes. Since testing hours were not provided, further emission calculations could not be performed.
2. It is assumed the aromatics includes benzene, toluene, xylenes, and ethylbenzene
3. It is assumed that total aldehydes includes formaldehyde.
4. Emissions are in lbs per hour; however, it is not known if this is per year, or per operational hours.

Confidence Level: Low based on lack of emission point data and speciation of hydrocarbons.

Source: "Texas Air Control Board 1975 Emissions Inventory Questionnaire" in folder BEEP-1-B, "Air Pollution Studies"

Bldg #	Emis Pt #	Material Used	Density (lb/gal)	Quantity Used	Units	Pollutant	1975 Emissions (tpy)	Days of Operation (days/week)	Hours of Operation (hrs/day)	Emissions in lbs/hour of operations	Controls Used	Stack/ Bldg Height (feet)	Comments
258	Unk	Perchloroethylene	13.5	6.2	tpy	Perchloroethylene	1.55E+00	5	24	4.97E-01		20 (B)	building height estimate
259	Unk	Perchloroethylene	13.5	4.2	tpy	Perchloroethylene	1.05E+00	5	24	3.37E-01		20 (B)	building height estimate
366	24	Toluene Degreasing	7.2	2.1	tpy	Toluene Degreasing	2.10E+00	5	8	2.02E+00		Unk	
		Thinning Solvent	6.75	1.0	tpy	Methyl Ethyl Ketone	1.00E+00			9.62E-01			
375	25	Thinning Solvent	6.75	2.0	tpy	Methyl Ethyl Ketone	2.00E+00	5	16	9.62E-01		87 (B)	
		Perchloroethylene	13.5	1.6	tpy	Perchloroethylene	4.00E-01			1.92E-01			
329	26	Perchloroethylene	13.5	1.9	tpy	Perchloroethylene	4.75E-01	4	24	1.90E-01		41.7 (B)	
365	28	Methylene Chloride	11.1	14.6	tpy	Methylene Chloride	1.46E+01	5	16	7.02E+00		110.5 (B)	
385	29	Methylene Chloride	11.1	9.3	tpy	Methylene Chloride	9.30E+00	5	16	4.47E+00		30 (S)	
300 Area	30	Perchloroethylene	13.5	21.5	tpy	Perchloroethylene	5.38E+00	5	16	2.58E+00		N/A	
324	36	Thinning Solvent	6.75	2.0	tpy	Methyl Ethyl Ketone	2.00E+00	5	24	6.41E-01		53.3 (B)	
		Perchloroethylene	13.5	2.4	tpy	Perchloroethylene	6.00E-01			1.92E-01			
360	38	Perchloroethylene	13.5	5.2	tpy	Perchloroethylene	1.30E+00	5	24	4.17E-01		57.6 (B) 30 (S)	

Notes:

1. Data was taken directly from the Texas Air Control Board questionnaire and cross-checked with the APSIS computer print out, which accounts for the rounding.
2. 100% volatization was assumed for all organic solvent use, 25% volatilization was used for degreasing.
3. Hours of operation, if not listed in the original documentation are assumed to be 24 hours per day, 5 days per week.
4. Equations taken from IERA AEI Guidance document, reference number 1.

Confidence Level: Medium based on differences found between TACB submission and questionnaire. Bldgs 258 259 are low confidence.

Source: 1978 Carbon Adsorber Survey

Bldg #	Emis Pt #	Description	Material Used	Density (lb/gal)	Quantity Used	Units	Pollutant	1978 Emissions (tpy)	Days of Operation (days/week)	Hours of Operation (hrs/day)	Emissions in lbs/hour of operation	Controls Used	Bldg/ Stack Height (feet)	Comments
348	14	Permit for Aircraft Engine Fuel Accessories Repair/Test Shop	Perchloroethylene	13.5	Unk	Unk	Perchloroethylene	5.48E-01	5	16	2.63E-01	Carbon Adsorber	30.5 (S)	Original information from 1978 Carbon Adsorber survey
			Carbon Remover	11.1	Unk	Unk	Methylene Chloride (60%)	9.00E-03	5	16	4.33E-03	None		See note 4

Confidence Level: Meduim based on uncertainty of stack height for 1978.

Source: "Inventory Data: 1988" Folder

Bldg #	Emis Pt #	Description	Material Used	Density (lb/gal)	Quantity Used	Units	Pollutant	1988 Emissions (tpy)	Days of Operation (days/week)	Hours of Operation (hrs/day)	Emissions in lbs/hour of operation	Controls Used	Stack Height (feet)	Comments
324	Unk	Vapor Degreasing	Perchloroethylene	13.5	Unk	Unk	Perchloroethylene	1.58E-01	5	24	5.05E-02	Unk	53.3 (B)	Original data from "Inventory Data: 1988" folder

Confidence Level: Medium due to lack of emission points and stack height.

Source: "Air Emissions Inventory CY 89" Folder

Bldg #	Emis Pt #	Description	Material Used	Density (lb/gal)	Quantity Used	Units	Pollutant	1989 Emissions (tpy)	Days of Operation (days/week)	Hours of Operation (hrs/day)	Emissions in lbs/hour of operation	Controls Used	Stack Height (feet)	Comments
Directorate of Maintenance	Unk	Vapor Degreasing	Perchloroethylene	13.5	96,000.0	gal/yr	Perchloroethylene	1.62E+02	5	24	5.19E+01	Unk	N/A	Original information from "Air Emissions Inventory CY89" folder

Confidence Level: Medium based on no building number, and assumed hours of operation.

Notes:

1. 100% volatization was assumed for all organic solvent use and 25% volatilization was assumed for vapor degreasing.
2. Hours of operation, if not listed in the original documentation are assumed to be 24 hours per day, 5 days per week.
3. 1989 data is from the Directorate of Maintenance and is a compilation of all maintenance shops (300 Area).
4. For 1978 data, assumed that original information assumed 60% methylene chloride in the carbon remover. This information was collected from an Material Safety Data Sheet (MSDS) for carbon remover.
5. Equations taken from AEI Guidance document, reference number 1

Source: "Air Emission Inventory - 1980" found in "Tab F - Miscellaneous 1982 Emission Inventory 13H2 - Air Pollution Studies."

Bldg #	Emis Pt #	Description	Material Used	Density (lb/gal)	Quantity Used	Units	Pollutant	1980 Emissions (tpy)	Days of Operation (days/week)	Hours of Operation (hrs/day)	Emissions in lbs/hour of operation	Controls Used	Stack Height (feet)	Notes
365		Solvent Usage	Methyl Ethyl Ketone	6.75	550	gal/mo	Methyl Ethyl Ketone(100%)	2.23E+01	5	24	7.14E+00	Unk	N/A	All operational hours are assumed.
			Phenolic Stripper	11.1	1,650	gal/mo	Methylene Chloride (60%)	6.59E+01			2.11E+01			
1420		Solvent Usage	Toluene	7.2	2	gal/wk	Toluene (100%)	3.74E-01	5	24	1.20E-01		N/A	
			Methyl Ethyl Ketone	6.75	4	gal/wk	Methyl Ethyl Ketone(100%)	7.02E-01			2.25E-01			
360		Paint Area	Toluene	7.2	4	gal/dy	Toluene (100%)	5.26E+00	5	24	1.68E+00		N/A	
			Methyl Ethyl Ketone	6.75	5	gal/dy	Methyl Ethyl Ketone (100%)	6.16E+00			1.97E+00			
301		Vapor Degreasing	Perchloroethylene	13.5	222,750	lbs/yr	Perchloroethylene (100%)	2.78E+01	5	24	8.92E+00		32 (B) 44.75(S)	
360		Cleaning Line	Perchloroethylene	13.5	63,085	gal/yr	Perchloroethylene (100%)	1.06E+02	5	24	3.41E+01		58 (B)	
			Phenolic Stripper	11.1	96,250	lbs/yr	Methylene Chloride (60%)	2.89E+01			9.25E+00		30 (S)	
		Machine Shop	Perchloroethylene	13.5	50	gal/mo	Perchloroethylene (100%)	7.50E-02			2.40E-02			
310		Stripper Use	Phenolic Stripper	11.1	60	gal/mo	Methylene Chloride (60%)	2.40E+00	5	24	7.68E-01		47.5(B)	
312		Vapor Degreasing	Perchloroethylene	13.5	275	gal/mo	Perchloroethylene (100%)	4.13E-01	5	24	1.32E-01		N/A	
324		Vapor Degreasing	Perchloroethylene	13.5	165	gal/mo	Perchloroethylene (100%)	2.48E-01	5	24	7.93E-02		53 (B)	
329		Vapor Degreasing	Perchloroethylene	13.5	10,230	gal/yr	Perchloroethylene(100%)	1.73E+01	5	24	5.53E+00		42 (B)	
		Solvent Usage	Methyl Ethyl Ketone	6.75	180	gal/mo	Methyl Ethyl Ketone (100%)	7.29E+00			2.34E+00			
		Carbon Remover	Phenolic Stripper	11.1	19,800	gal/yr	Methylene Chloride (60%)	6.59E+01			2.11E+01			Green Worm
351		Vapor Degreasing	Perchloroethylene	13.5	5,500	gal/yr	Perchloroethylene (100%)	9.28E+00	5	24	2.97E+00		26.5 (B)	
366		Stripper Use	Phenolic Stripper	11.1	660	gal/yr	Methylene Chloride (60%)	2.20E+00	5	24	7.04E-01		N/A	
		Solvent Usage	Methyl Ethyl Ketone	6.75	240	gal/yr	Methyl Ethyl Ketone (100%)	8.10E-01			2.60E-01			
375		Vapor Degreasing	Perchloroethylene	13.5	110	gal/mo	Perchloroethylene (100%)	1.65E-01	5	24	5.29E-02		87 (B)	
		Solvent Usage	Methyl Ethyl Ketone	6.75	55	gal/mo	Methyl Ethyl Ketone (100%)	2.23E+00			7.14E-01			
301	5 to 8	Chrome plating	Chromic acid	2.7	40,838	gal/yr	Chromic acid (99%)	2.73E+04	N/A	N/A	4.61E-02		36 (S)	from plating shop survey, 25% loss

Notes:

1. 100% volatization was assumed for all organic solvent use, 25% volatization was assumed for degreasing.
2. Hours of operation, if not listed in the original documentation are assumed to be 24 hours per day, 5 days per week.
3. Chromic acid emissions are estimated based on documentation from a plating shop survey, and include accomodations for a 25% loss of the chromic acid. Data was reported in grams per day and pounds per day and converted to tons per year and pounds per hour (based on 24 hours per day operation). All chromium is assumed hexavalent.
4. A concentration of 60% methylene chloride was assumed for all phenolic stripper, based on information from the MSDS.
5. Equations taken from IERA AEI Guidance document, reference number 1

Confidence Level: Medium based on assumed hours of operation and lack of emission points.

Source: "Air Pollution Emission Inventory, Kelly Air Force Base, Calendar Year 1982" Performed by Bioenvironmental Engineering

Bldg #	Emis Pt #	Description	Material Used	Density (lb/gal)	Quantity Used	Units	Pollutant	1982 Emissions (tpy)	Days of Operation (days/week)	Hours of Operation (hrs/day)	Emissions in lbs/hour of operation	Controls Used	Bldg/ Stack Height (feet)	Comments
655 Area		TF-39			N/A	N/A	Benzene	3.10E-02	N/A	120 hrs/yr	5.17E-01	None	Unk	
							Ethylbenzene	1.74E-02			2.90E-01			
							Formaldehyde	1.23E-01			2.06E+00			
							Methyl Ethyl Ketone	3.21E-02			5.34E-01			See note 3
							Toluene	1.11E-02			1.85E-01			
							m,p-Xylene	3.30E-03			5.50E-02			
							o-Xylene	1.74E-03			2.90E-02			
		T-56			N/A	N/A	Benzene	9.30E-03	N/A	540 hrs/yr	3.45E-02	None	Unk	
							Ethylbenzene	1.21E-04			4.49E-04			
							Formaldehyde	8.03E-03			2.98E-02			
							Methyl Ethyl Ketone	2.60E-05			9.63E-05			See note 3
							Toluene	5.30E-04			1.96E-03			
							m,p-Xylene	6.08E-05			2.25E-04			
							o-Xylene	6.26E-05			2.32E-04			
N/A		Solvent Usage	Perchloroethylene	13.5	150,516.0	gal/yr	Perchloroethylene (100%)	2.54E+02	5	24	8.14E+01	None	N/A	
N/A			MEK	6.75	26,016.0	gal/yr	Methyl Ethyl Ketone (100%)	8.78E+01	5	24	2.81E+01	None	N/A	
N/A			Toluene	7.2	15,552.0	gal/yr	Toluene (100%)	5.60E+01	5	24	1.79E+01	None	N/A	
N/A			Paint Remover and Stripper	11.1	238,291.0	gal/yr	Methylene Chloride (60%)	7.94E+02	5	24	2.54E+02	None	N/A	

Notes:

1. 100% volatization was assumed for all organic solvent use, 25% volatization was assumed for degreasing.
2. Hours of operation, if not listed in the original documentation are assumed to be 24 hours per day, 5 days per week.
3. For the TF-39 engine, fuel flow is 1,448 lbs of fuel/hour and for the T-56, the flow is 724 lbs of fuel/hour (Reference number 1). Emission factors (in lbs pollutant/1000 lbs fuel) for each chemical can be found in the IERA AEI Guidance document (Reference number 1). Also, a 60 minute test time at idle was assumed for incomplete combustion. No emission factors are available for the T-56 engine for ethylbenzene, toluene, and o-xylene at the idle setting, so factors for the approach setting were used.
4. Emission factors and fuel flow factors are for JP-8 and not JP-4. Speciation information does not exist for JP-4.
5. Equations taken from AEI Guidance document, reference number 1

Confidence Level: Medium based on assumed hours of operation, lack of building numbers, and emission point data.

Source: "TACB Air Emissions Inventory, Accomp. 1985 for 1984."

Bldg #	Emis Pt #	Description	Material Used	Density (lb/gal)	Quantity Used	Units	Pollutant	1984 Emissions (tpy)	Days of Operation (days/week)	Hours of Operation (hrs/day)	Emissions in lbs/hour of operation	Controls Used	Stack/ Bldg Height (feet)	Comments
348	7	Vapor Degreaser	Perchloroethylene	13.5	N/A	N/A	Perchloroethylene (100%)	2.13E+00	7	24	4.86E-01	None	30 (B)	Emissions are in tpy from original information
365			Phenolic Paint Stripper	11.1	88,550	gal/yr	Methylene Chloride (60%)	2.95E+02						
			Methyl Ethyl Ketone	6.75	12,000	gal/yr	Methyl Ethyl Ketone (100%)	4.05E+01						
375	26	Stripping and Cleaning	Methyl Ethyl Ketone	6.75	1,100	gal/yr	Methyl Ethyl Ketone (100%)	3.71E+00	5	16	1.78E+00	None	87 (B)	
	27		Phenolic Paint Stripper	11.1	5,000	gal/yr	Methylene Chloride (60%)	1.67E+01	5	16	8.00E+00			
	N/A		Methyl Ethyl Ketone	6.75	1,100	gal/yr	Methyl Ethyl Ketone (100%)	3.71E+00	5	16	1.78E+00			
301	28	Plating Shop	Chromic Acid	N/A	See note 9		Hexavalent Chromium	4.00E-03	7	24	9.16E-04	Scrubbers	36 (S)	Emissions are estimated according to original report. It is assumed that the estimates account for controls used.
	29							4.00E-03	5	22	1.40E-03		36 (S)	
	32							4.00E-03	7	24	9.16E-04		36 (S)	
	33							4.00E-03	5	22	1.40E-03		36 (S)	
	34							4.00E-03	5	22	1.40E-03		36 (S)	
	35							4.00E-03	5	22	1.40E-03		36 (S)	
	36							4.00E-03	7	24	9.16E-04		36 (S)	
	37							4.00E-03	5	22	1.40E-03		36 (S)	
	65	Chemical Cleaning	Perchloroethylene	13.5	4,800	gal/yr	Perchloroethylene (100%)	8.10E+00	5	18	3.46E+00	None	30 (S)	
	44	Vapor Degreaser	Perchloroethylene	13.5	60,000	gal/yr	Perchloroethylene (100%)	1.01E+02	5	16	4.87E+01	None	25 (S)	Assume total is for both stacks
	45													
340	48	GTE Test Cells	JP-4	6.5	96,000	gal/yr	Benzene	2.95E-06	N/A	1458 hrs/yr	4.05E-06	None	20 (S)	See notes 1,4, and 5
							Ethylbenzene	4.72E-07			6.48E-07			
							Formaldehyde	4.00E-06			5.48E-06			
							Methyl Ethyl Ketone	N/A			N/A			
							Toluene	8.66E-07			1.19E-06			
							m,p Xylene	4.65E-07			6.37E-07			
							0-Xylene	6.46E-08			8.86E-08			

Confidence Level: Medium based on assumed hours of operation, emission point data, and lack of jet engine test cell emission factors.

Source: "TACB Air Emissions Inventory, Accomp. 1985 for 1984."

Bldg #	Emis Pt #	Description	Material Used	Density (lb/gal)	Quantity Used	Units	Pollutant	1984 Emissions (tpy)	Days of Operation (days/week)	Hours of Operation (hrs/day)	Emissions in lbs/hour of operation	Controls Used	Stack/ Bldg Height (feet)	Comments
385	50	Paint Stripping	Phenolic Paint Stripper	11.1	11,500	gal/yr	Methylene Chloride (60%)	3.83E+01	5	16	1.84E+01	None	30 (S)	
			Methyl Ethyl Ketone	6.75	5,000	gal/yr	Methyl Ethyl Ketone (100%)	1.69E+01					14.8 (B)	
1155	61	Non Destructive Insp.	Perchloroethylene	13.5	60	gal/yr	Perchloroethylene (100%)	4.05E-01	5	8	3.89E-01	None	20 (S)	
360	70	Paint Shop	Methyl Ethyl Ketone	6.75	1,320	gal/yr	Methyl Ethyl Ketone (100%)	4.46E+00	5	16	2.14E+00	None	57.6 (B 30 (S)	

Notes:

1. Building 340 tested a number of small gas-turbine engines (GTE). All of the model engines were listed, but the only model that Earth Tech could find an emission factor for was the GTCP85-180. All engines were assumed to be GTCP85-180 for the purpose of this estimate.
2. 100% volatization was assumed for all organic solvent use, 25% volatization was assumed for degreasing.
3. Hours of operation, if not listed in the original documentation are assumed to be 24 hours per day, 5 days per week.
4. Emission factors and fuel flow factors are for JP-8 and not JP-4. Documentation for JP-4 does not exist.
5. For the GTCP 85-180 engine, fuel flow is 270 lbs of fuel/hour (Reference number 1). Emission factors (in lbs pollutant/1000 lbs fuel) for each chemical can be found in the IERA AEI Guidance document (Reference number 1). Also, a 60 minute test time at idle was assumed for incomplete combustion. No emission factors were available for Methyl Ethyl Ketone.
6. A concentration of 60% methylene chloride was assumed for all phenolic stripper.
7. It is assumed that all hard and decroative electroplating was accounted for, as well as anodizing. It is also assumed that the estimates take into controls (if any) used.
8. Equations taken from AEI Guidance document, reference number 1.

Confidence Level: Medium based on assumed hours of operation, emission point data, and lack of jet engine test cell emission factors.

Source: "Air Inventory: CY 1985" and "Air Emissions Inventory 1985"

Bldg #	Emis Pt #	Description	Material Used	Density (lb/gal)	Quantity Used	Units	Pollutant	1985 Emissions (tpy)	Days of Operation (days/week)	Hours of Operation (hrs/day)	Emissions in lbs/hour of operation	Controls Used	Bldg/ Stack Height (feet)	Comments
340	48	GTE Test Cells	JP-4	6.5	115,000	gal/yr	Benzene	3.40E-06		1681 hrs/yr	4.05E-06	None	20 (S)	See notes 1,4, and 5
							Ethylbenzene	5.45E-07			6.48E-07			
							Formaldehyde	4.61E-06			5.48E-06			
							Methyl Ethyl Ketone	N/A			N/A			
							Toluene	9.99E-07			1.19E-06			
							m,p-Xylene	5.36E-07			6.37E-07			
							o-Xylene	7.44E-08			8.86E-08			
365		Painting	Methyl Ethyl Ketone	6.75	12,400	gal/yr	Methyl Ethyl Ketone (27.5%)	1.15E+01		7032 hrs/yr	3.27E+00	Unk	110 (S)	Assume similar production as in 1986
		Paint Stripping	Methylene Chloride	11.1	285,000	gal/yr	Methylene Chloride (60%)	9.49E+02		7032 hrs/yr	2.70E+02			
		MEK Use	Methyl Ethyl Ketone	6.75	6,600	gal/yr	Methyl Ethyl Ketone (100%)	2.23E+01	5	24	5.10E+00	Unk	Unk	
361		Painting (C-130 only)	Methyl Ethyl Ketone	6.75	1,200	gal/yr	Methyl Ethyl Ketone (27.5)	1.11E+00		1440 hrs/yr	1.55E+00	Unk	109.5 (B)	
375		Paint Stripping	Methylene Chloride	11.1	24,710	gal/yr	Methylene Chloride (60%)	8.23E+01	5	24	2.64E+01	Unk	87 (B)	
652 & 655		Test Cells T-56	JP-4	6.5	Unk		Benzene	8.32E-07		483 hrs/yr	3.45E-06	None	20 (S)	See notes 4 and 5
							Ethylbenzene	1.08E-07			4.48E-07			
							Formaldehyde	7.19E-06			2.98E-05			
							Methyl Ethyl Ketone	2.33E-08			9.63E-08			
							Toluene	4.74E-07			1.96E-06			
							m,p-Xylene	5.44E-07			2.25E-06			
							o-Xylene	5.65E-08			2.34E-07			
652 & 655		Test Cells TF-39	JP-4	6.5	Unk		Benzene	1.58E-05		61 hrs/yr	5.17E-04	None	50.28 (B)	
							Ethylbenzene	8.83E-07			2.90E-05		for 652	
							Formaldehyde	6.27E-05			2.06E-03		51.17 (B)	
							Methyl Ethyl Ketone	1.63E-06			5.34E-05		for 655	
							Toluene	5.65E-06			1.85E-04		20(S)	
							m,p-Xylene	1.68E-06			5.50E-05		for both	
							o-Xylene	8.83E-07			2.90E-05			
385		Wash Rack	Paint Stripper	11.1	70,525	gal/yr	Methylene Chloride (60%)	2.35E+02	5	24	7.53E+01		14.83 (B)	

Confidence Level: Medium based on assumed hours of operation, lack of emission data for jet engine test cells, and lack of emission point data.

Source: "Air Inventory: CY 1985" and "Air Emissions Inventory 1985"

Bldg #	Emis Pt #	Description	Material Used	Density (lb/gal)	Quantity Used	Units	Pollutant	1985 Emissions (tpy)	Days of Operation (days/week)	Hours of Operation (hrs/day)	Emissions In lbs/hour of operation	Controls Used	Bldg/ Stack Height (feet)	Comments
360		Degreasing Operations	Perchloroethylene	13.5	90,200	gal/yr	Perchloroethylene (100%)	1.52E+02	5	24	4.88E+01		57.63(B) 30 (S)	
301		Degreasing Operations	Perchloroethylene	13.5	24,000	gal/yr	Perchloroethylene (100%)	4.05E+01	5	24	1.30E+01		32.42 (B) 44.75 (S)	
324		Degreasing Operations	Perchloroethylene	13.5	2,825	gal/yr	Perchloroethylene (100%)	4.77E+00	5	24	1.53E+00		53.27 (B)	
366		Painting	Zinc Chromate Primer	11.2	132	gal/yr	Zinc Chromate (50%)	9.24E-03	5	24	2.96E-03		Unk	See notes 8 and 9
		Thinner	Methyl Ethyl Ketone	6.75	30	gal/yr	Methyl Ethyl Ketone (100%)	1.01E-01	5	24	3.25E-02			

Notes:

1. Building 340 tested a number of small gas-turbine engines (GTE). All of the model engines were listed, but the only model that Earth Tech could find an emission factor for was the GTCP85-180. All engines were assumed to be GTCP85-180 for the purpose of this estimate.
2. 100% volatization was assumed for all organic solvent use, 25% was assumed for degreasing
3. Hours of operation, if not listed in the original documentation are assumed to be 24 hours per day, 5 days per week.
4. Emission factors and fuel flow factors are for JP-8 and not JP-4. Speciated emission factors for JP-4 do not exist.
5. For the GTCP 85-180 engine, fuel flow is 270 lbs of fuel/hour, for the TF-39 engine, the fuel flow is 1,448 lbs of fuel/hour, and for the T-56 engine, the fuel flow rate is 724 lbs of fuel/hour (Reference number 1). Emission factors (in lbs pollutant/1000 lbs fuel) for each chemical can be found in the IERA AEI Guidance document (Reference number 1). Also, a 60 minute test time at idle was assumed for incomplete combustion. No emission factors were available for Methyl Ethyl Ketone for the GTCP 85-180 engine. No emission factors for the idle setting were available for ethylbenzene and o-xylene for the T-56 engine, so approach emission factors were used.
6. A concentration of 60% methylene chloride was assumed for all phenolic stripper.
7. Methyl Ethyl Ketone (MEK) is in both parts of a 2-part paint. The percentage of MEK is a result of a volume per volume average.
8. Zinc Chromate and MEK were used only for 8 months of the year, however it is assumed that the same product in the same proportion was used for the other 4 months for the most conservative estimate.

Confidence Level: Medium based on assumed hours of operation, lack of emission data for jet engine test cells, and lack of emission point data.

Source: "Air Inventory CY 86."

Bldg #	Emis Pt #	Description	Material Used	Density (lb/gal)	Quantity Used	Units	Pollutant	1986 Emissions (tpy)	Days of Operation (days/week)*	Hours of Operation (hrs/day)	Emissions in lbs/hour of operation	Controls Used	Bldg/ Stack Height (feet)	Comments
365	Unk	Paint Hangar - B52	Primer	6.75	1,200	gal/yr	Methyl Ethyl Ketone (10%)	4.05E-01	5 days per AC	24	2.70E-01	Unk	110 (B)	25 Aircraft Painted/year
				7.2	1,200		Toluene (15%)	6.48E-01			4.32E-01			
			Deft Paint	6.75	3,450	gal/yr	Methyl Ethyl Ketone (27.5%)	3.20E+00			2.13E+00			See note 7
365		Paint Hangar - C-5A	Primer	6.75	1,680	gal/yr	Methyl Ethyl Ketone (10%)	5.67E-01	12 days per AC	24	2.81E-01			14 Aircrart Painted/year
				7.2	1,680		Toluene (15%)	9.07E-01			4.50E-01			
			Stripper	11.1	63,140	gal/yr	Methylene Chloride (60%)	2.10E+02			1.04E+02			
			Deft Paint	6.75	4,760	gal/yr	Methyl Ethyl Ketone (27.5%)	4.42E+00			2.19E+00			See note 7
365		Degreasing	Perchloroethylene	13.5	57,000	gal/yr	Perchloroethylene (100%)	9.62E+01	5	24	3.08E+01			
385	Unk	Stripping Hangar - B-52	Stripper	11.1	41,250	gal/yr	Methylene Chloride (60%)	1.37E+02	5 days per AC	24	9.16E+01	Unk	14.8 (B)	25 Aircraft Painted/year
		Stripping Hangar - C-5A	Stripper	11.1	24,000	gal/yr	Methylene Chloride (60%)	7.99E+01	12 days per AC	24	3.96E+01			14 Aircrart Painted/year
361	Unk	Paint Hangar - C130	Deft Paint	6.75	3,120	gal/yr	Methyl Ethyl Ketone (27.5%)	2.90E+00	2 days per AC	24	4.02E+00	Unk	109.5 (B)	30 Aircraft Painted/year
348	7	Degreaser	Perchloroethylene	13.5	Unk		Perchloroethylene (100%)	8.50E+00	5	24	2.72E+00	Exhaust Stack	30 (B)	Used estimates provided in "Kelly AFB Air Emission Source Inventory" December 1987
	20	Vapor Degreasing	Perchloroethylene	13.5	Unk		Perchloroethylene (100%)	5.50E+01	5	24	1.76E+01	Exhaust Stack		
301	44	Degreaser	Perchloroethylene	13.5	Unk		Perchloroethylene (100%)	1.35E+02	5	24	4.33E+01	Degreaser Vents	32.4 (B)	
	45	Degreaser	Perchloroethylene	13.5	Unk		Perchloroethylene (100%)	2.70E+02	5	24	8.65E+01	Degreaser Vents	44.75 (S)	

Confidence Level: Medium based on assumed hours of operation and lack of emission point data.

Source: "Air Inventory CY 86."

Bldg #	Emis Pt #	Description	Material Used	Density (lb/gal)	Quantity Used	Units	Pollutant	1986 Emissions (tpy)	Days of Operation (days/week)	Hours of Operation (hrs/day)	Emissions in lbs/hour of operation	Controls Used	Bldg/ Stack Height (feet)	Comments
360	65	Chemical Cleaning	Perchloroethylene/Alcohol	13.5	Unk		Perchloroethylene (100%)	3.24E+01	5	24	1.04E+01	Exhaust Stack	109.5 (B)	Assume that alcohol is not included in estimate
324	109	Vapor Degreasing	Perchlorethylene	13.5	Unk		Perchloroethylene (100%)	5.00E-01	5	24	1.60E-01	Unk	53.3 (B)	

Notes:

2. 100% volatization was assumed for all organic solvent use, 25% volatilization was assumed for degreasing.
3. Hours of operation, if not listed in the original documentation are assumed to be 24 hours per day, 5 days per week.
4. A concentration of 60% methylene chloride was assumed for all phenolic stripper.
5. There was less than 5% strontium chromate in the paints, which Earth Tech did not consider a calculable amount.
6. Although the primer consisted of 2 parts, it was not necessary to combine the two since there was 10% MEK in part one and 15% toluene in part two.
7. Methyl Ethyl Ketone (MEK) is in both parts of a 2-part paint. The percentage of MEK is a result of a volume per volume average.
8. Equations are taken from AEI Guidance document, reference number 1.

Confidence Level: Medium based on assumed hours of operation and lack of emission point data.

General Equation for General Air Emissions

1. Density of chemical in lbs/gal = specific gravity of chemical x density of water (8.33)
2. Emissions in tons per year = (density of chemical in lbs/gal x concentration of chemical x assumed volatilization) / 2000 lbs per ton
3. Emissions in pounds per hour = emissions in tons per year x 2000 / operating hours
4. Emissions in pounds per hour for painting activities = emissions in tons per year x 2000 / (time to paint one aircraft x 24 hours x number aircraft painted per year)

Note: If concentration of chemical or volatilization was 100%, no input was required.

Inputs for General Air Emissions

	Specific Gravity
Perchloroethylene	13.5
Methylene Chloride	11.1
Toluene	7.2
Methyl Ethyl Ketone	6.75

Equation for Jet Engine Testing

General equation: Emissions = emission factor (in pounds of pollutant per 1000 pounds of fuel) x fuel flow factor (in pounds of fuel per hour) / 2000 lbs per ton

Note: Fuel flow factors and emission factors can be found in respective worksheets.

Source: May 1999 Air Emissions Inventory Guidance, Institute for Environment, Safety, and Occupational Health Risk Assessment, Brooks AFB, TX

Table ES-5
Hazardous Air Pollutant Emissions Summary
GTCP85-180 (APU)

		Engine Operating Mode	
		Constant	
Exhaust Flow Rate, dscfm		5,542	
Fuel Flow Rate, lbs/hr		270	
Compound	**CAS Number**	lbs/hr	lbs/1,000 lbs fuel*
Formaldehyde	50000	5.50E-03	2.03E-02
Acetaldehyde	75070	5.64E-04	2.09E-03
Acrolein	107028	8.22E-05	3.04E-04
Isobutyraldehyde / Methyl Ethyl Ketone	78842/78933		
Naphthalene	91203	0.00E+00	0.00E+00
Benzene	71432	4.05E-03	1.50E-02
Toluene	108883	1.18E-03	4.36E-03
Ethylbenzene	100414	3.26E-05	1.21E-04
m,p-Xylene	1330207	6.37E-04	2.36E-03
o-Xylene	95476	8.85E-05	3.28E-04
Styrene	100425	5.16E-05	1.91E-04
Total HAPs		1.22E-02	4.51E-02

This table summarizes the hazardous air pollutants which are typical fuel combustion by-products. An expanded pollutant target list, and data qualifiers is provided in Volume II.

Note: A blank represents a compound that was not detected.

* - Emission factors provided in pounds per thousand pounds of fuel were calculated using the lbs/hr rate and the fuel flow rate.

Results reported as 0.00 indicate a detected ambient pollutant concentration greater than the detected pollutant concentration in the exhaust stream.

SOURCE: Institute for Environment, Safety and Occupational Health Risk Analysis, Environmental Analysis Division, Air Quality web site: http://sg-www.satx.disa.mil/iera/rse/JP-8data.htm

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Table ES-3
Hazardous Air Pollutant Emissions Summary
T56-A-7 (C-130)

		Engine Operating Mode							
		Idle		Approach		Intermediate		Military	
Exhaust Flow Rate, dscfm		122,033		125,564		125,427		145,801	
Fuel Flow Rate, lbs/hr		724		880		1,742		2,262	
Compound	CAS Number	lbs/hr	lbs/1,000 lbs fuel*	lbs/hr	lbs/1,000 lbs fuel*	lbs/hr	lbs/1,000 lbs fuel*	lbs/hr	lbs/1,000 lbs fuel*
Formaldehyde	50000	2.97E-02	4.11E-02	2.94E-02	3.34E-02	1.62E-02	9.27E-03	8.62E-04	3.81E-04
Acetaldehyde	75070	7.54E-03	1.04E-02	0.00E+00	0.00E+00	9.46E-04	5.43E-04	3.72E-04	1.64E-04
Acrolein	107028								
Isobutyraldehyde / Methyl Ethyl Ketone	78842/78933	9.60E-05	1.33E-04	6.16E-05	7.00E-05			1.40E-04	6.18E-05
Naphthalene	91203	8.40E-04	1.16E-03	9.11E-04	1.04E-03	3.08E-04	1.77E-04	3.02E-04	1.34E-04
Benzene	71432	3.45E-03	4.76E-03	3.91E-03	4.45E-03	2.34E-03	1.34E-03	1.78E-03	7.86E-04
Toluene	108883	1.96E-03	2.71E-03	2.02E-03	2.29E-03	1.67E-03	9.60E-04	5.74E-05	2.52E-05
Ethylbenzene	100414			5.45E-04	6.19E-04	5.46E-04	3.12E-04	4.06E-04	1.80E-04
m,p-Xylene	1330207	2.24E-04	3.11E-04	6.44E-04	7.32E-04	7.22E-04	4.15E-04	1.42E-03	6.28E-04
o-Xylene	95476			2.84E-04	3.23E-04	2.92E-04	1.68E-04	5.62E-04	2.49E-04
Styrene	100425			3.22E-04	3.66E-04				
Total HAPs		4.39E-02	6.06E-02	3.81E-02	4.33E-02	2.30E-02	1.32E-02	5.90E-03	2.61E-03

This table summarizes the hazardous air pollutants which are typical fuel combustion by-products. An expanded pollutant target list, and data qualifiers is provided in Volume II.

Note: A blank represents a compound that was not detected.

* - Emission factors provided in pounds per thousand pounds of fuel were calculated using the lbs/hr rate and the fuel flow rate.

Results reported as 0.00 indicate a detected ambient pollutant concentration greater than the detected pollutant concentration in the exhaust stream.

SOURCE: Institute for Environment, Safety and Occupational Health Risk Analysis, Environmental Analysis Division, Air Quality web site: http://sg-www.satx.disa.mil/iera/rse/JP-8data.htm

Table ES-4
Hazardous Air Pollutant Emissions Summary
TF39-GE-1C(C-5)

		Engine Operating Mode							
		Idle		Approach		Intermediate		Military	
Exhaust Flow Rate, dscfm		510,030		1,844,298		2,028,301		2,147,268	
Fuel Flow Rate, lbs/hr		1,448		10,477		12,541		13,862	
Compound	CAS Number	lbs/hr	lbs/1,000 lbs fuel*	lbs/hr	lbs/1,000 lbs fuel*	lbs/hr	lbs/1,000 lbs fuel*	lbs/hr	lbs/1,000 lbs fuel*
Formaldehyde	50000	2.06E+00	1.42E+00	8.54E-02	8.15E-03	6.14E-02	4.90E-03	1.46E-01	1.06E-02
Acetaldehyde	75070	3.07E-01	2.12E-01	3.31E-02	3.16E-03	3.27E-03	2.61E-04	8.55E-03	6.17E-04
Acrolein	107028	2.99E-01	2.06E-01						
Isobutyraldehyde / Methyl Ethyl Ketone	78842/78933	5.35E-02	3.69E-02			2.95E-03	2.35E-04	3.41E-03	2.46E-04
Naphthalene	91203	1.41E-01	9.71E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzene	71432	5.18E-01	3.57E-01	1.63E-02	1.56E-03	1.76E-02	1.41E-03	2.99E-02	2.16E-03
Toluene	108883	1.86E-01	1.28E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ethylbenzene	100414	2.91E-02	2.00E-02	1.86E-02	1.78E-03	6.26E-03	4.99E-04	0.00E+00	0.00E+00
m,p-Xylene	1330207	5.52E-02	3.80E-02	0.00E+00	0.00E+00	2.38E-02	1.90E-03	0.00E+00	0.00E+00
o-Xylene	95476	2.90E-02	2.00E-02	1.62E-02	1.57E-03	8.57E-03	6.83E-04	0.00E+00	0.00E+00
Styrene	100425	6.51E-02	4.48E-02					1.28E-02	9.26E-04
Total HAPs		3.74E+00	2.58E+00	1.70E-01	1.62E-02	1.24E-01	9.89E-03	2.01E-01	1.45E-02

This table summarizes the hazardous air pollutants which are typical fuel combustion by-products. An expanded pollutant target list, and data qualifiers is provided in Volume II.

Note: A blank represents a compound that was not detected.

* - Emission factors provided in pounds per thousand pounds of fuel were calculated using the lbs/hr rate and the fuel flow rate.

Results reported as 0.00 indicate a detected ambient pollutant concentration greater than the detected pollutant concentration in the exhaust stream.

SOURCE: Institute for Environment, Safety and Occupational Health Risk Analysis, Environmental Analysis Division, Air Quality web site: http://sg-www.satx.disa.mil/iera/rse/JP-8data.htm

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APPENDIX D
TEAM, LLC'S AIR EMISSIONS ESTIMATE

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Worksheet Legend

The following paragraphs explain the purpose of each worksheet included in this workbook.

Summary Emissions Estimates - The data included in this worksheet should be used by ATSDR for modeling purposes. The worksheet includes the compiled emissions in tons per year for the target chemicals. The data was prioritized using the assumptions listed in Appendix B. All data conversions are performed in this worksheet.

Raw Data (Complete Data Set) - This worksheet includes all data included in the information sources provided. No calculations or data reduction is performed in this worksheet.

1990s (Sorted) - This worksheet includes the data for the 1990s included in the information sources provided. This data was extracted from the Raw Data (Complete Data Set) worksheet. All data used in the Summary Emissions Estimates worksheet is highlighted in blue.

1980s (Sorted) - This worksheet includes the data for the 1980s included in the information sources provided. This data was extracted from the Raw Data (Complete Data Set) worksheet. All data used in the Summary Emissions Estimates worksheet is highlighted in blue.

1970s (Sorted) - This worksheet includes the data for the 1970s included in the information sources provided. This data was extracted from the Raw Data (Complete Data Set) worksheet. All data used in the Summary Emissions Estimates worksheet is highlighted in blue.

Engine Running Time - This worksheet includes the calculations used to estimate aircraft engine emissions during testing.

Calculations - This worksheet includes the conversion factors used to convert the various data types included in the original data set.

Estimated Emissions per year

			1980s data					1970s data				
Building	Description	Chemical	Usage	Units	Concentration (mg/m3)	Estimated Emissions (Tons/yr)	Notes	Usage	Units	Concentration (mg/m3)	Estimated Emissions (Tons/yr)	Notes
258	Unknown	Chromic Acid								0.0165	1.28E-07	Assume 100 CFM volume emission; 1978 data
259	Unknown	Chromic Acid								0.0415	3.23E-07	Assume 100 CFM volume emission; 1975 data
		Perchloroethylene								30	2.33E-04	Assume 100 CFM volume emission; 1978 data
301	Chromic Acid Stack Concentration	Stack Sample			2.15	1.67E-05	Assume 100 CFM Volume; 1980 data					
301	Chemical Cleaning	Perchloroethylene	405	T/yr		1.01E+02	Assume 25% volatilization					
		Ethyl Benzene	0.016	gal/mo		6.66E-04	Assume 100% volatilization					
		Methylene Chloride	1.485	gal/mo		9.87E-02	Assume 100% volatilization					
		Toluene	6.668	gal/mo		2.77E-01	Assume 100% volatilization					
		Methyl Ethyl Ketone	3.6	gal/mo		1.46E-01	Assume 100% volatilization					
305	MATPME Paint Shop	Chromic Acid	20	gal/mo		6.75E-02	Assume 2.5% overspray					
308	Electronics	Toluene	25	gal/mo		1.04E+00	Assume 100% volatilization					
		Methylene Chloride	1	gal/mo		6.65E-02	Assume 100% volatilization					
		Methyl Ethyl Ketone	2	gal/mo		8.10E-02	Assume 100% volatilization					
324	Metalizing/coatings	Methyl Ethyl Ketone	6	gal/mo		2.43E-01	Assume 100% volatilization; Assume worst case value (1985 6 gal/mo)					
		Toluene	0.75	gal/mo		3.12E-02	Assume 100% volatilization					
329	Paint Area Facility	Perchloroethylene	4.34	T/yr		1.09E+00	Assume 25% volatilization; Assume that all emissions are perchloroethylene					
347	Jet test stands	Benzene	107697	mins testing		1.86E-01	1382 tests conducted in 1982; average 78 mins per test; total is 107, 697 mins testing per year; T-56-A7 emission factors					
348		Ethylbenzene	107697	mins testing		2.42E-02	1382 tests conducted in 1982; average 78 mins per test; total is 107, 697 mins testing per year; T-56-A7 emission factors					
		Formaldehyde	107697	mins testing		1.60E+00	1382 tests conducted in 1982; average 78 mins per test; total is 107, 697 mins testing per year; T-56-A7 emission factors					
		Methyl Ethyl Ketone	107697	mins testing		5.07E-02	1382 tests conducted in 1982; average 78 mins per test; total is 107, 697 mins testing per year; T-56-A7 emission factors					
		Toluene	107697	mins testing		1.06E-01	1382 tests conducted in 1982; average 78 mins per test; total is 107, 697 mins testing per year; T-56-A7 emission factors					
		m,p Xylene	107697	mins testing		1.21E-02	1382 tests conducted in 1982; average 78 mins per test; total is 107, 697 mins testing per year; T-56-A7 emission factors					
		o Xylene	107697	mins testing		1.25E-02	1382 tests conducted in 1982; average 78 mins per test; total is 107, 697 mins testing per year; T-56-A7 emission factors					

Estimated Emissions per year

			1980s data					1970s data				
Building	Description	Chemical	Usage	Units	Concentration (mg/m3)	Estimated Emissions (Tons/yr)	Notes	Usage	Units	Concentration (mg/m3)	Estimated Emissions (Tons/yr)	Notes
348	Degreaser(s)	Perchloroethylene				6.35E+01	Assume Perchloroethylene is degreaser (100%); calculated value from AEI				3.90E-01	Assume 25% volatilization; 1978 data
360	Paint Shop	Perchloroethylene				4.74E+01	Calculated value from 1987/1988 AEI; assume all degreasers contain Perc			20.125	1.56E-04	Assume 100 CFM volume emission; 1978 data
361	Paint Facility	Perchloroethylene				5.92E+00	Calculated value from 1987/1988 AEI; assume contaminant is Perc (based on volume of emission)					
365	Paint Shop Hangar	Methylene Chloride			164.50	2.60E+02	Calculated value from 1987/1988 AEI					
		Chromic Acid			0.10	8.09E-07	Assume 10 CFM emission volume					
		Toluene			44.00	3.42E-04	Assume chemical is toluene from paint					
		Methyl Ethyl Ketone			31.79	4.10E+01	Assume 10 CFM emission volume			99.4	7.73E-04	Assume 100 CFM volume emission; 1973 data
		Perchloroethylene			1.05	8.15E-06	Assume 10 CFM emission volume					
375	Welding shop/paint/degrease	Methyl Ethyl Ketone	32.95	gal/mo		1.33E+00	Assume 100% volatilization; 1989 data					
		Chromic Acid	13.5	gal/mo		4.55E-02	Assume 0.1% overspray; 1989 data					
		Methylene Chloride	1	gal/mo		6.65E-02	Assume 100% volatilization; 1988 data					
		Toluene	27.05	gal/mo		1.12E+00	Assume 100% volatilization; 1989 data					
		Perchloroethylene	22.5	gal/mo		4.55E-01	Assume 25% volatilization; 1988 data					
		Benzene								66.2	5.15E-04	Assume 100 CFM volume emission; 1979 data
385	Paint stripping	Methyl Ethyl Ketone				5.10E+01	Calculated value from 1987 AEI					
645	Zinc Chromate priming	Chromic Acid			0.06	5.01E-07	Assume 10 CFM emission volume					
		Methyl Ethyl Ketone	3	gal/yr		1.01E-02	Assume 100% volatilization					
647	General usage	Toluene	3.6	gal/mo		1.50E-01	Assume 100% volatilization					
920	Solvent Tank	Perchloroethylene				3.00E-01	Assume solvent tank contains perc					
1420	Special Weapons	Chromic Acid								1.2	9.33E-06	Assume 100 CFM volume emission; 1971 data
3020	Coatings	Chromic Acid								0.003	2.33E-08	Assume 100 CFM volume emission; 1973 data

General Emissions 1985 Data/Building Number Unknown

Perchloroethylene	109.58
Methyl Ethyl Ketone	67.47
Stripper (50%) MC	394.71

Summary of estimated 1980s emissions

Perchloroethylene	219.61 T/yr
Chromic Acid	0.11 T/yr
Methyl Ethyl Ketone	93.86 T/yr
Methylene Chloride	260.23 T/yr
Ethyl Benzene	0.02 T/yr
Toluene	2.73 T/yr
Benzene	0.19 T/yr
Xylenes	0.02 T/yr
Formaldehyde	1.60 T/yr

Summary of estimated 1970s emissions

Perchloroethylene	3.90E-01 T/yr
Chromic Acid	9.80E-06 T/yr
Methyl Ethyl Ketone	7.73E-04 T/yr
Methylene Chloride	T/yr
Ethyl Benzene	T/yr
Toluene	T/yr
Benzene	5.15E-04 T/yr
Xylenes	T/yr
Formaldehyde	T/yr

Summary Referemces List

Building	Resource
	1980s References
87	AF Form 2761, Building 87, 4 October 1987
247/248	Grandfathered Source Registration Forms, Jet Engine Test Stands, 14 January 1986
301	AF Form 2761, Building 301, 9 June 1986
	AF Form 2761, Building 301, 1988
308	AF Form 2761, Building 308, 16 September 1987
	Chemical inventory, Building 308, 16 June 1980
324	Calculated airborne concentration worksheet, Building 324, 15 May 1991
	Plating Shop Scrubber Removal Efficiency Memo, 17 November 1980
	AF Form 2761, Building 324, 16 March 1983
	AF Form 2761, Building 324, 23 May 84
	AF Form 2761, Building 324, 22 May 1984
	AF Form 2761, Building 324, October 1985
	AF Form 2761, Building 324, 24 September 1986
	AF Form 2761, Building 324, 14 May 1986
	AF Form 2761, Building 324, 26 June 1987
	AFSC Form 3511, Building 324, 24 February 1988
	AF Form 2761, Building 324, 21 October 1988
	AF Form 2761, Building 324, 10 September 1989
	AF Form 2761, Building 324, 19 June 1989
	AF Form 2762, Building 324, various years data
329	AMD Form 641, Building 329, 31 October 1985
360	Monthly Chemical Requirements Memo, Building 360, 26 November 1984
	OEHL Form 7, Building 360, 17 April 1980
	Unnamed report "supporting services and data", building 360, Jul-Aug 1980
	AMD Form 641, Building 360, 28 June 1985
	AF Form 3132, Building 360, 17 October 1988
	AFSC Form 3511, Building 360, 30 April 1987
	AF Form 2761, Building 360, 1989-1991
	AF Form 2761, Building 360, 6 July 1987
	AF Form 2761, Building 360, 1 June 1988
	AF Form 2761, Building 360, 3 April 1987
	AF Form 2761, Building 360, 27 May 1986
365	Chemical Sampling data, Building 365, 1980-1985
	AMD Form 641, Building 365, 30 April 1985
	Form 215A, Building 365, 12 June 1973
375	AF Form 2761, Building 375, 26 October 1989
	AF Form 2761, Building 375, 11 July 1988

AF Form 2761, Building 375, 2 October 1985
AF Form 2761, Building 375, 20 July 1988

385 AF Form 2761, Building 385, May 1991

814 AF Form 2761, Building 814, 13 March 1984

892 AF Form 2761, Building 892, 4 May 1987

910 AF Form 2761, Building 910, 21 October 1986

1155 AF Form 2761, Building 1155, 2 October 1989

1414 AF Form 2761, Building 1414, 5 August 1987

3020 AF Form 215A, Building 3020, 27 April 1973

Misc. Air Emissions Inventory Buildings 301, 340, 347, 348, 375, 360, 365, 385, Jet Engine Test Cells,
Air Emission Source Inventory, December 1986
Air Pollution Emissions Inventory, 1982
Air Emission Source Inventory, December 1987

1970s Resources

258/259 Report of Study of Trichloroethylene Vapor Degreasers in Buildings 258 and 259, 20 March 1973
General Room Concentration Results Graph, Building 258/259 20 February 1976
AF Form 215A laboratory analyses results, building 258, 10 March 1976
AF Form 215A laboratory analyses results, building 259, 24 February 1976

360 OEHL Chemical analyses, Building 360, 3 April 1978
OEHL Chemical analyses, Building 360, 27 March 1978
OEHL Chemical analyses, Building 360, 20 March 1978
OEHL Chemical analyses, Building 360, 27 March 1978

934 OEHL Form 7, Building 934, 11 July 1979

Misc. AF Form 215A Test for Quantiy of Trichloroethylene exhausted into Atmosphere, 1973
1975 Memo. Air Pollution Emissions from Air Force Engine Test Facilities

1990s Resources

301 AF Form 2761, Building 301, 1990

1627 Memo for Record, Building 1627, 20 March 1986

2028 AF Form 2761, Building 2028, 24 February 1986

Bldg #	Emis Pt #	Description	Material Used	Amount Used or Time Run	Unit	Specific Gravity	Fuel Flow (lbs/1000 lbs)	Density (lb/gal)	Pollutant	Emission Factor	Controls Used	Estimated Emissions	UNITS	Comments
347/348		test stands	summary emission								yes	160,220	lb/yr	1982 data; 85% removal efficiency (emissions controls)
		Jet engine test cells	JP-4						PA			9,826	lb/yr	1368 engines tested in 1982; various types
									CO			162,681	lb/yr	
									HC			42,290	lb/yr	
									SOX			10,450	lb/yr	
									NOX			85,041	lb/yr	
310		foam-in-place operations	MC	20701 (lb/yr)				11.07	MC	100		20,701	lb/yr	
366		foam-in-place operations	MC	3045 (lb/yr)				11.07	MC	100		3,045	lb/yr	
?		general emission calcs							MEK	100		179,510	lb/yr	
?		general emission calcs							perc	25		507,992	lb/yr	
?		general emission calcs							TCE	50		17,424	lb/yr	
?		general emission calcs							toluene	100		15,552	lb/yr	
?		general emission calcs							stripper (MC?)	100		238,291	lb/yr	
348	7	plating and cleaning engine parts	area sample						Perc		no	8.50	tons/yr	1986 data
365	24	air craft painting	area sample						MC		yes	260.00	tons/yr	
			area sample						MEK		yes	41.00	tons/yr	
375	26	air craft parts painting	area sample						MEK		no	3.80	tons/yr	
	27	stripping/cleaning	area sample						MEK		no	4.00	tons/yr	
301	44	vapor degreasing	area sample						perc		yes	135.00	tons/yr	
	45	vapor degreasing	area sample						perc		yes	270.00	tons/yr	
360	65	chemical cleaning/degreasing	area sample						perc		no	32.40	tons/yr	
	70	paint shop	area sample						MEK		yes	8.90	tons/yr	
385	50	paint stripping	area sample						MEK		no	17.00	tons/yr	
329	1	paint area facility	area sample						?			0.16	tons/yr	1986 data
	2	paint area facility	area sample						?			0.13	tons/yr	
	3	paint area facility	area sample						?			3.10	tons/yr	
	4	paint area facility	area sample						?			0.05	tons/yr	
	5	paint area facility	area sample						?			0.00	tons/yr	
	6	paint area facility	area sample						?			0.00	tons/yr	
	7	paint area facility	area sample						?			0.30	tons/yr	
	8	paint area facility	area sample						?			0.30	tons/yr	
	9	paint area facility	area sample						?			0.30	tons/yr	
1592	3	JP-4 Storage Tank	JP-4									6.00	tons/yr	1987 data
946	57	JP-4 fuel bladders	JP-4									0.16	tons/yr	
371	73-76	JP-4 Storage Tank	JP-4									0.20	tons/yr	each tank
960	84-93	JP-4 Storage Tank	JP-4									0.39	tons/yr	each tank
38	4	Diesel Storage Tank	Diesel									6.00	tons/yr	
38	71	Diesel Storage Tank	Diesel									0.15	tons/yr	
1504	72	Diesel Storage Tank	Diesel									0.10	tons/yr	
960	89	Av gas storage	av gas									0.20	tons/yr	
348	7	Degreaser	perc									8.50	tons/yr	
301	44	Degreaser	perc									135.00	tons/yr	
301	45	Degreaser	perc									270.00	tons/yr	
360	65	Degreaser	perc									32.40	tons/yr	
348	8	electric drying oven	?									3.78	tons/yr	
	11	test stand	?									1.13	tons/yr	
	12	test stand	?									1.13	tons/yr	
	13	test stand	?									0.03	tons/yr	
	14	test stand	?									0.03	tons/yr	
	15	test stand	?									0.03	tons/yr	
	17	test stand	?									0.05	tons/yr	
	18	test stand	?									0.05	tons/yr	
	21	test stand	?									0.05	tons/yr	
	22	test stand	?									1.13	tons/yr	
	23	test stand	?									324.00	tons/yr	
365	24	Paint	?									22.07	tons/yr	
375	26	Paint Facility	?									19.00	tons/yr	
375	27	Paint Phenols	?									0.01	tons/yr	
301	46	Paint Facility	?									51.00	tons/yr	
385	50	Paint Stripping	?									0.30	tons/yr	
920	56	Solvent Tank	?									1.13	tons/yr	
1155	61	NDI	?									15.00	tons/yr	
360	70	Paint Shop	?									5.92	tons/yr	
361	96	Paint Facility	?											

Bldg #	Emis Pt #	Description	Material Used	Amount Used or Time Run	Unit	Specific Gravity	Fuel Flow (lbs/1000 lbs)	Density (lb/gal)	Pollutant	Emission Factor	Controls Used	Estimated Emissions	UNITS	Comments
366	97	Paint Facility	?									8.29	tons/yr	
329	100	Paint Booth	?									0.30	tons/yr	
	101	Paint Booth	?									0.30	tons/yr	
	102	Paint Booth	?									0.30	tons/yr	
	103	Paint Booth	?									3.10	tons/yr	
	104	Paint Booth	?									0.13	tons/yr	
	105	Drying Oven	?									0.16	tons/yr	
	106	Drying Oven	?									0.05	tons/yr	
	107	Drying Oven	?									0.00	tons/yr	
	108	Drying Oven	?									0.00	tons/yr	
3060	1	Waste Incinerator	?									120.70	tons/yr	
360	67	Metalizing	?									35.70	tons/yr	
360	69	Shot peeling	?									34.20	tons/yr	
ramp	94	Refueling emissions	JP-4									38.20	tons/yr	
348	9	Vapor Blast	?									55.00	tons/yr	
360	62	Chemical Cleaning	?									0.02	tons/yr	
	63	Chemical Cleaning	?									0.05	tons/yr	
	64	Chemical Cleaning	?									0.01	tons/yr	
375	111	Purging Fluid Tank	?									92.00	tons/yr	
	112	Purging Fluid Tank	?									92.00	tons/yr	
	113	Purging Fluid Tank	?									92.00	tons/yr	
	114	Purging Fluid Tank	?									92.00	tons/yr	
?				65000	gal				perc					1985 Data
?				20000	gal				MEK					
?				142510	gal				stripper					
?				17500	gal				carbon remover					
365				66000	gal				stripper					
				6600	gal				MEK					
1592	3	JP-4 Storage Tank	JP-4									6.00	tons/yr	1986 data; emission rates are caluculated
38	4	Diesel Storage Tank	Diesel									6.00	tons/yr	
348	7	Degreaser	perc									8.50	tons/yr	
348	8	electric drying oven	?									3.78	tons/yr	
	11	test stand	?									1.13	tons/yr	
	12	test stand	?									1.13	tons/yr	
	13	test stand	?									0.03	tons/yr	
	14	test stand	?									0.03	tons/yr	
	15	test stand	?									0.03	tons/yr	
	17	test stand	?									0.05	tons/yr	
	18	test stand	?									0.05	tons/yr	
	20	Degreaser	?									55.00	tons/yr	
	21	test stand	?									0.05	tons/yr	
	22	test stand	?									0.05	tons/yr	
	23	test stand	?									1.13	tons/yr	
365	24	Paint	?									324.00	tons/yr	
375	26	Paint Facility	?									22.07	tons/yr	
375	27	Paint Phenols	?									19.00	tons/yr	
301	44	Degreaser	perc									135.00	tons/yr	
301	45	Degreaser	perc									270.00	tons/yr	
385	50	Paint Stripping	?									51.00	tons/yr	
920	56	Solvent Tank	?									0.30	tons/yr	
946	57	JP-4 fuel bladders	JP-4									0.16	tons/yr	
1155	61	NDI	?									1.13	tons/yr	
360	65	Degreaser	perc									32.40	tons/yr	
360	70	Paint Shop	?									15.00	tons/yr	
38	71	Diesel Storage Tank	Diesel									0.15	tons/yr	
1504	72	Diesel Storage Tank	Diesel									0.10	tons/yr	
371	73-76	JP-4 Storage Tank	JP-4									0.20	tons/yr	each tank
960	84-93	JP-4 Storage Tank	JP-4									0.39	tons/yr	each tank
ramp	94	Refueling emissions	JP-4									38.20	tons/yr	
361	96	Paint Facility	?									5.92	tons/yr	
366	97	Paint Facility	?									8.29	tons/yr	
329	100	Paint Booth	?									0.30	tons/yr	
	101	Paint Booth	?									0.30	tons/yr	
	102	Paint Booth	?									0.30	tons/yr	
	103	Paint Booth	?									3.10	tons/yr	

Bldg #	Emis Pt #	Description	Material Used	Amount Used or Time Run	Unit	Specific Gravity	Fuel Flow (lbs/1000 lbs)	Density (lb/gal)	Pollutant	Emission Factor	Controls Used	Estimated Emissions	UNITS	Comments
	104	Paint Booth	?											
	105	Drying Oven	?									0.13	tons/yr	
	106	Drying Oven	?									0.16	tons/yr	
	107	Drying Oven	?									0.05	tons/yr	
	108	Drying Oven	?									0.00	tons/yr	
375	111	Purging Fluid Tank	?									0.00	tons/yr	
	112	Purging Fluid Tank	?									92.00	tons/yr	
	113	Purging Fluid Tank	?									92.00	tons/yr	
	114	Purging Fluid Tank	?									92.00	tons/yr	
348	115	Carbon Absorption Unit	?									92.00	tons/yr	
												1.80	lbs/hr	
348	9	Repair/test shop	area sample											
									perc		yes	12.00	lbs/day	1976 Data
258		E5-E6	product	1375	gal/2mo				TCA			269.00	lbs/day	1973 data; assumes 100% volatilization
		E5	product	605	gal/2mo				TCA			118.00	lbs/day	
		A3	product	1210	gal/2mo				TCA			237.00	lbs/day	
		E1-E2	product	1045	gal/2mo				TCA			205.00	lbs/day	
		A1-A2	product	1045	gal/2mo				TCA			172.00	lbs/day	
259		C1	product	1870	gal/2mo				TCA			334.00	lbs/day	
		D5-E5	product	1045	gal/2mo				TCA			172.00	lbs/day	
324		B5-B6	product	495	gal/2mo				TCA			70.00	lbs/day	
		A25-A26	product	55	gal/2mo				TCA			3.90	lbs/day	
		D10	product	305	gal/2mo				TCA			27.00	lbs/day	
		h1-bay	product	165	gal/2mo				TCA			20.00	lbs/day	
		B36	product	165	gal/2mo				TCA			32.00	lbs/day	
329		M15	product	660	gal/2mo				TCA			102.00	lbs/day	
		B2-B3	product	70	gal/2mo				TCA			14.00	lbs/day	
		F3	product	220	gal/2mo				TCA			43.00	lbs/day	
		F3-4	product	220	gal/2mo				TCA			43.00	lbs/day	
341		Cell 40	product	220	gal/2mo				TCA			29.00	lbs/day	
351		D6-7	product	550	gal/2mo				TCA			97.00	lbs/day	
375		C56	product	265	gal/2mo				TCA			36.00	lbs/day	
		C12-D13	product	165	gal/2mo				TCA			21.00	lbs/day	
		L63	product	220	gal/2mo				TCA			43.00	lbs/day	
1414		A3	product	605	gal/2mo				TCA			108.00	lbs/day	
3008		B7	product	275	gal/2mo				TCA			46.00	lbs/day	
		E5-D5	product	165	gal/2mo				TCA			18.00	lbs/day	
3020		C10-D10	product	110	gal/2mo				TCA			21.00	lbs/day	
		E16	product	605	gal/2mo				TCA			97.00	lbs/day	
		F16	product	770	gal/2mo				TCA			129.00	lbs/day	
		G18	product	165	gal/2mo				TCA			12.00	lbs/day	
		R13	product	1210	gal/2mo				TCA			208.00	lbs/day	
		T11	product	1265	gal/2mo				TCA			248.00	lbs/day	
		R11	product	495	gal/2mo				TCA			97.00	lbs/day	
		R17	product	660	gal/2mo				TCA			96.00	lbs/day	
		L13-M13	product	880	gal/2mo				TCA			151.00	lbs/day	
		Q18	product	660	gal/2mo				TCA			101.00	lbs/day	
		Q13	product	605	gal/2mo				TCA			85.00	lbs/day	
?		Stack emissions	unknown	8.80	lbs/yr				Hex Chrome					1985 data
			unknown	60,000.00	lbs/yr				Perc					
?		Radome stripping	unknown						MEK			46.00	mg/m3	1979 data
			unknown						MEK			110.00	mg/m3	
			unknown						MEK			16.00	mg/m3	
			unknown						MEK			10.00	mg/m3	
259		general room concentration	area sample						Perc		>30		mg/m3	1976 data
258/259		degreasing/cleaning	area sample	205	gal/wk				TCE					unknown
259		Chrome mist fallout	area sample						chromic acid			0.0415	mg/m3	1975 data from stack emission
258		vapor degreasing	area sample						TCA		>100		ppm	1973 data; personal air sampling
		tank 7	area sample						TCA		>100		ppm	
		tank 2	area sample						TCA			187	ppm	
		tank 5	area sample						TCA			186	ppm	

Bldg #	Emis Pt #	Description	Material Used	Amount Used or Time Run	Unit	Specific Gravity	Fuel Flow (lbs/1000 lbs)	Density (lb/gal)	Pollutant	Emission Factor	Controls Used	Estimated Emissions	UNITS	Comments
259		tank 10	area sample						TCA			>100	ppm	
258		Chromic acid measurements	area sample						chromic acid			.004-.007	mg/m3	1976 data
		Chromium measurements	area sample						chrome			.001-.026	mg/m3	
?		Chromic acid	product	3000	gal/mo				chrome					1973 data
		Trichloroethylene	product	10000	gal/mo				TCA			9000	gal/mo	
301		Chromic Acid stack concentration	stack sample						Chromic Acid			1.7-2.6	mg/m3	1980 data
301		baseline data	Product	845	gal/wk				perc					1986 data
			coating	0.016	gal/mo				ethyl benzene					
			paint	1.11	gal/mo				MC					
			coating	0.648	gal/mo				Toluene					
			paint	0.15	gal/mo				MEK					
			paint	0.27	gal/mo				Toluene					
			stripper	0.375	gal/mo				MC					
			product	3300	gal/mo				perc					
			coating	0.75	gal/mo				Toluene					
			paint	0.45	gal/mo				MEK					
			lubricant	5	gal/mo				Toluene					
			lubricant	3	gal/mo				MEK					
			product	5	gal/mo				perc					
			lube-lok	0.2	gal/mo				dichloroethane					
303		disposal		550	gal/mo				perc					Date? Disposed of through DRMO
				1100	gal/mo				111-TCE					
				0.25	gal/mo				Toluene					
				0.25	gal/mo				MEK					
				10	gal/mo				Chromic acid					consumed in process
				10	gal/mo				Chromic acid					consumed in process
305		MATPME paint shop	paint	<10	gal/mo				Chromic acid					1985 data
			paint	<10	gal/mo				Chromic acid					
308		Electronic operations	humiseal	>1	gal/mo				Toluene					1987 data
			humiseal	>1	gal/mo				MC					
			degreaser	5	gal/mo				111 TCA					
			product	2	gal/mo				MEK					
			product	25	gal/mo				Trichloroethane					
		electronic repair	product	24	gal/mo				Toluene					
		electronic repair/paintshop	product	270	gal/wk				TCE					
324		metalizing/wire spray	coating	14	lbs/mo				Toluene			0.73	mg/m3	1991 data
			coating						MEK			4.28	mg/m3	
324		metalizing/wire spray	metalizing plasma						chromium					1986 data; very low concentrations
			metalizing plasma						perc					very low concentrations
			metalizing plasma						MEK					very low concentrations
324		metalizing area	plasma spray						perc			335	mg/m3	1981 data
			plasma spray						perc			335	mg/m3	
			plasma spray						MEK			590	mg/m3	
			plasma spray						perc			335	mg/m3	
			plasma spray						MEK			590	mg/m3	
			plasma spray						chromium			0.5	mg/m3	
			plasma spray						chromium			0.5	mg/m3	
			plasma spray						perc			335	mg/m3	
			plasma spray						MEK			590	mg/m3	
			plasma spray						perc			335	mg/m3	
			plasma spray						MEK			590	mg/m3	
324		metalizing/wire spray	metalizing plasma						111 TCA			162	mg/m3	1988 data
			metalizing plasma						111 TCA			155	mg/m3	
			metalizing plasma						111 TCA			161	mg/m3	
			metalizing plasma						MEK			1	mg/m3	
			metalizing plasma						MEK			2	mg/m3	

Bldg #	Emis Pt #	Description	Material Used	Amount Used or Time Run	Unit	Specific Gravity	Fuel Flow (lbs/1000 lbs)	Density (lb/gal)	Pollutant	Emission Factor	Controls Used	Estimated Emissions	UNITS	Comments
324		metalizing area	metalizing plasma	55	gal/mo				perc					1986 data; disposed through DRMO
			metalizing plasma	3	gal/mo				MEK					disposed of through DRMO
			metalizing plasma	10	lbs/mo				Chromium					consumed in process
324		metalizing area	metalizing plasma	275	gal/mo				perc			12	mg/m3	1984 data
324		metalizing area	metalizing plasma	330	gal/mo				perc					1983 data
324		metalizing area	coating	6	gal/mo				MEK					1985 data
			coating	10	gal/mo				111 TCA					
			coating	0.25	gal/mo				Toluene					
324		metalizing area	coating	0.24	gal/mo				toluene					1989 data
			coating	0.51	gal/mo				toluene					
329		GTE starter cleaning	area sample						perc			54.43	mg/m3	1985 data; average of 7 samples
329		AMAD Test Stand	area sample						Perc			8.9	mg/m3	1991 data; average of 2 samples
347		electrical repair area	personal sampling						Perc			40	mg/m3	1984 data; air sampling
									Perc			1	mg/m3	
348		parts cleaning area	general usage	55	gal/mo									unknown
360		metalizing operations	personal sampling						Perc			739	mg/m3	1980 data
			personal sampling						Perc			1448	mg/m3	
			personal sampling						Perc			9	mg/m3	
360		metalizing operations	personal sampling						Perc			22	mg/m3	1986 data
			personal sampling						Perc			22	mg/m3	
360		metalizing operations	parts cleaning tanks						hex chrome			0.12	mg/m3	1984 data
			parts cleaning tanks						hex chrome			0.03	mg/m3	
360		metalizing operations	Perc	330	gal/mo									1984 data
			MEK	110	gal/mo									
			MEK	110	gal/mo									
			toluene	55	gal/mo									
360		metalizing operations	area sampling						Perc			3.3	mg/m3	1978 data
			area sampling						Perc			3.1	mg/m3	
			area sampling						Perc			1.2	mg/m3	
			area sampling						Perc			0.8	mg/m3	
			area sampling						Perc			0.75	mg/m3	
			area sampling						Perc			19.6	mg/m3	
			area sampling						Perc			43	mg/m3	
			area sampling						Perc			32	mg/m3	
			area sampling						Perc			49	mg/m3	
			area sampling						Perc			22	mg/m3	
			area sampling						Perc			28	mg/m3	
			area sampling						Perc			34	mg/m3	
			area sampling						Perc			23	mg/m3	
			area sampling						Perc			22	mg/m3	
360		penetrant spray area	area sampling						benzene			2	mg/m3	1985 data
			area sampling						benzene			1	mg/m3	
			area sampling						benzene			2	mg/m3	
			area sampling									3	mg/m3	
			area sampling						perc			25	mg/m3	
			area sampling						111 TCA			277	mg/m3	
360		metalizing operations	area sampling						MC			1.33	mg/m3	1988 data
			area sampling						toluene			0.65	mg/m3	
			area sampling						MC			0.86	mg/m3	
360		metalizing operations	area sampling						Perc			20	mg/m3	1989 data?

Bldg #	Emis Pt #	Description	Material Used	Amount Used or Time Run	Unit	Specific Gravity	Fuel Flow (lbs/1000 lbs)	Density (lb/gal)	Pollutant	Emission Factor	Controls Used	Estimated Emissions	UNITS	Comments
			area sampling						MEK			74	mg/m3	
360		metalizing operations	area sampling						Perc			739	mg/m3	1980 data
360		metalizing operations	area sampling						Perc			0.333	mg/m3	1987 data
			area sampling						Perc			0.264	mg/m3	
			area sampling						Perc			0.354	mg/m3	
			area sampling						Perc			0.495	mg/m3	
			area sampling						Perc			0.316	mg/m3	
			area sampling						Perc			0.546	mg/m3	
			area sampling						Perc			2.651	mg/m3	
			area sampling						Perc			0.286	mg/m3	
			area sampling						Perc			0.209	mg/m3	
			area sampling						MEK			0.14	mg/m3	
			area sampling						MEK			0.26	mg/m3	
			area sampling						MEK			0.039	mg/m3	
			area sampling						MEK			0.252	mg/m3	
			area sampling						MEK			0.077	mg/m3	
365		Paint shop hangar	area sampling						MC			164.5	mg/m3	1986 data
			area sampling						Chromates			0.104	mg/m3	
			area sampling						Toluene			44	mg/m3	
			area sampling						MEK			190	mg/m3	
365		Cleaning C5 with MEK	MEK						MEK			211	mg/m3	1973 data
			MEK						MEK			13	mg/m3	
			MEK						MEK			147	mg/m3	
			MEK						MEK			90	mg/m3	
			MEK						MEK			36	mg/m3	
365		Hex Chrome sampling	paint/primer						hex chrome			0.01	mg/m3	1985 data; personal sampling
			paint/primer						hex chrome			0.03	mg/m3	
			paint/primer						hex chrome			0.03	mg/m3	
			paint/primer						hex chrome			0.62	mg/m3	
			paint/primer						hex chrome			0.35	mg/m3	
			paint/primer						hex chrome			0.35	mg/m3	
375		Wing fuel cell sampling	fuel						benzene			2	mg/m3	1979 data
			fuel						benzene			176	mg/m3	area sample; front
			fuel						benzene			5	mg/m3	area sample; back
			fuel						benzene			135	mg/m3	area sample; front
			fuel						benzene			13	mg/m3	area sample; back
375		welding shop	MEK	3	gal/mo				MEK					1982 data
375			degreaser	2	gal/mo				111 TCA					1983 data
375		welding shop	paint/primer	5	gal/mo				toluene					1989 data; component of paint
			paint/primer	3.5	gal/mo				MEK					
			paint/primer	3	gal/mo				MEK					
			paint/primer	1	gal/mo				MEK					
			paint/primer	1	gal/mo				MEK					
			paint/primer	1	gal/mo				MEK					
			paint/primer	0.5	gal/mo				MEK					
			paint/primer	13.95	gal/mo				MEK					
			paint/primer	1.55	gal/mo				toluene					
			paint/primer	1	gal/mo				MEK					
			paint/primer	0.5	gal/mo				MC					
			paint/primer	2	gal/mo				toluene					
			paint/primer	12	gal/mo				toluene					
			paint/primer	0.5	gal/mo				toluene					
			paint/primer	6	gal/mo				MEK					
			paint/primer	6	gal/mo				toluene					
			paint/primer	2	gal/mo				MEK					
375		Area sampling	area sample						chromium			<.011	mg/m3	1991 data; area sampling

Bldg #	Emis Pt #	Description	Material Used	Amount Used or Time Run	Unit	Specific Gravity	Fuel Flow (lbs/1000 lbs)	Density (lb/gal)	Pollutant	Emission Factor	Controls Used	Estimated Emissions	UNITS	Comments
375		General usage	degreaser	22.5	gal/mo				perc					1988 data; general usage
375		General usage	paint/lubricant	<1	gal/mo				toluene					
			paint/lubricant	<1	gal/mo				MEK					
375		General usage	MEK	10	gal/mo				MEK					1988 data; general usage
			degreaser	12.25	gal/mo				111 TCA					
			Corr. Resist. Coati	13.5	gal/mo				chromic acid					
			rubber base adhes	1	gal/mo				MEK					
			primer	1	gal/mo				MC					
			primer	1	gal/mo				toluene					
385		General usage	alodine 1200	1	gal/mo				Chromic acid					1990 data; general usage
			MEK	440	gal/mo				MEK					
			MEK	50	gal/mo				MEK					
			paint stripper	2400	gal/mo				MC					
			paint stripper	2730	gal/mo				MC					
			paint stripper	330	gal/mo				MC					
			paint stripper	480	gal/mo				MC					
			alodine 1200	<2	gal/mo				Chromic acid					
385		General usage	MEK	50	gal/mo				MEK					
645		Zinc chromate painting	paint/primer						chromate			0.094	mg/m3	1987 data; TWA; worst case scenario (doors closed)
			paint/primer						chromate			0.035	mg/m3	TWA; worst case scenario (doors closed)
			paint/primer	3	gal/yr				MEK					
1155		NDI operations	degreaser	55	gal/yr				Perc					1989 data; general usage
			penetrant	0.2	gal/yr				111 TCA					
1420		Special Weapons	explosive testing						Chromium			1.2	mg/m3	1971 data; area sample
1627		Chemical mixing operations	photo chemicals						formaldehyde			6	mg/m3	1986 data; area sample
2028		General usage	paint/primer	<2	gal/mo				Toluene					1986 data
			paint/primer	<2	gal/mo				MEK					
3020		area air sample	sermatel? operation						chromates			0.002	mg/m3	1973 data
			sermatel? operation						chromates			0.004	mg/m3	
3020		General usage (3 buildings)	pickling/rinsing	40	gal/wk				Chromic Acid					date unknown
3008			degreasing	1000	gal/wk				TCA					
3052			degreasing	110	gal/wk				TCE					
3820		Air samples	paint booth						Chromium			0.059	mg/m3	1980 data
3794		area samples	paint						Toluene			12.02	mg/m3	1990 data
647		General usage	paint	3.6	gal/mo				toluene					1989 data
324		personal air sampling	vap. Degreaser						TCE			<100	mg/m3	1973 data
375			vap. Degreaser						TCE			<100	mg/m3	

Note1: Quantities already calculated in mg/m3.
Note 2: General usage quantity calculated from percent of chemical and quanitity listed in resource

Bldg #	Emis Pt #	Description	Material Used	Percentage	Amount Used or Time Run	Unit	Specific Gravity	Fuel Flow (lbs/1000 lbs)	Density (lb/gal)	Pollutant	Emission Factor	Controls Used	Estimated Emissions	UNITS	Comments
324		metalizing/wire spray	coating	See note 1	14	lbs/mo				Toluene			0.73	mg/m3	1991 data
			coating							MEK			4.28	mg/m3	
329		AMAD Test Stand	area sample							Perc			8.9	mg/m3	1991 data; average of 2 samples
375		Area sampling	area sample							chromium			<.011	mg/m3	1991 data; area sampling
385		General usage	alodine 120	See note 1	1	gal/mo				Chromic acid					1990 data; general usage
			MEK	See note 1	440	gal/mo				MEK					
			MEK	See note 1	50	gal/mo				MEK					
			paint strippe	See note 1	2400	gal/mo				MC					
			paint strippe	See note 1	2730	gal/mo				MC					
			paint strippe	See note 1	330	gal/mo				MC					
			paint strippe	See note 1	480	gal/mo				MC					
			alodine 120	See note 1	<2	gal/mo				Chromic acid					
3794		area samples	paint							Toluene			12.02	mg/m3	1990 data

Bldg #	Emis Pt #	Description	Material Used	Percentage	Amount Used or Time Run	Unit	Pollutant	Emission Factor	Controls Used	Estimated Emissions	UNITS	Comments
301		Chromic Acid stack concentration	stack sample				Chromic Acid			1.7-2.6	mg/m3	1980 data
301		baseline data	Product	See note 1	845	gal/wk	perc					1986 data
			coating	See note 1	0.016	gal/mo	ethyl benzene					1986 data
			paint	See note 1	1.11	gal/mo	MC					1986 data
			coating	See note 1	0.648	gal/mo	Toluene					1986 data
			paint	See note 1	0.15	gal/mo	MEK					1986 data
			paint	See note 1	0.27	gal/mo	Toluene					1986 data
			stripper	See note 1	0.375	gal/mo	MC					1986 data
			product	See note 1	3300	gal/mo	perc					1986 data
			coating	See note 1	0.75	gal/mo	Toluene					1986 data
			paint	See note 1	0.45	gal/mo	MEK					1986 data
			lubricant	See note 1	5	gal/mo	Toluene					1986 data
			lubricant	See note 1	3	gal/mo	MEK					1986 data
			product	See note 1	5	gal/mo	perc					1986 data
			lube-lok	See note 1	0.2	gal/mo	dichloroethane					1986 data
301	44	vapor degreasing	area sample				perc		yes	135.00	tons/yr	1987 data
	45	vapor degreasing	area sample				perc		yes	270.00	tons/yr	1987 data
301	44	Degreaser	perc									
301	45	Degreaser	perc							135.00	tons/yr	1987 data
										270.00	tons/yr	1987 data
301	46	Paint Facility	Unknown							0.01	tons/yr	1987 data
301	44	Degreaser	perc									
301	45	Degreaser	perc							135.00	tons/yr	1986 data; emission rates are caluculated
										270.00	tons/yr	1986 data; emission rates are caluculated
305		MATPME paint shop	paint		<10	gal/mo	Chromic acid					1985 data
			paint		<10	gal/mo	Chromic acid					1985 data
308		Electronic operations	humiseal	See note 1	>1	gal/mo	Toluene					1987 data
			humiseal	See note 1	>1	gal/mo	MC					1987 data
			product	See note 1	2	gal/mo	MEK					1987 data
			product	See note 1	25	gal/mo	Trichloroethane					1987 data
		electronic repair	product	See note 1	24	gal/mo	Toluene					1987 data
324		metalizing area	coating	See note 1	6	gal/mo	MEK					1985 data
			coating	See note 1	0.25	gal/mo	Toluene					1985 data
324		metalizing area	coating	See note 1	0.24	gal/mo	toluene					1989 data
			coating	See note 1	0.51	gal/mo	toluene					1989 data
329		GTE starter cleaning	area sample				perc			54.43	mg/m3	1985 data; average of 7 samples
329	1	paint area facility	area sample				Unknown/Assumed perc			0.16	tons/yr	1986 data
	2	paint area facility	area sample				Unknown/Assumed perc			0.13	tons/yr	1986 data
	3	paint area facility	area sample				Unknown/Assumed perc			3.10	tons/yr	1986 data
	4	paint area facility	area sample				Unknown/Assumed perc			0.05	tons/yr	1986 data
	5	paint area facility	area sample				Unknown/Assumed perc			0.00	tons/yr	1986 data
	6	paint area facility	area sample				Unknown/Assumed perc			0.00	tons/yr	1986 data
	7	paint area facility	area sample				Unknown/Assumed perc			0.30	tons/yr	1986 data
	8	paint area facility	area sample				Unknown/Assumed perc			0.30	tons/yr	1986 data
	9	paint area facility	area sample				Unknown/Assumed perc			0.30	tons/yr	1986 data
329	100	Paint Booth	Unknown							0.30	tons/yr	1987 data

Bldg #	Emis Pt #	Description	Material Used	Percentage	Amount Used or Time Run	Unit	Pollutant	Emission Factor	Controls Used	Estimated Emissions	UNITS	Comments
	101	Paint Booth	Unknown							0.30	tons/yr	1987 data
	102	Paint Booth	Unknown							0.30	tons/yr	1987 data
	103	Paint Booth	Unknown							3.10	tons/yr	1987 data
	104	Paint Booth	Unknown							0.13	tons/yr	1987 data
	105	Drying Oven	Unknown							0.16	tons/yr	1987 data
	106	Drying Oven	Unknown							0.05	tons/yr	1987 data
	107	Drying Oven	Unknown							0.00	tons/yr	1987 data
	108	Drying Oven	Unknown							0.00	tons/yr	1987 data
329	100	Paint Booth	Unknown							0.30	tons/yr	1986 data; emission rates are caluculated
	101	Paint Booth	Unknown							0.30	tons/yr	1986 data; emission rates are caluculated
	102	Paint Booth	Unknown							0.30	tons/yr	1986 data; emission rates are caluculated
	103	Paint Booth	Unknown							3.10	tons/yr	1986 data; emission rates are caluculated
	104	Paint Booth	Unknown							0.13	tons/yr	1986 data; emission rates are caluculated
	105	Drying Oven	Unknown							0.16	tons/yr	1986 data; emission rates are caluculated
	106	Drying Oven	Unknown							0.05	tons/yr	1986 data; emission rates are caluculated
	107	Drying Oven	Unknown							0.00	tons/yr	1986 data; emission rates are caluculated
	108	Drying Oven	Unknown							0.00	tons/yr	1986 data; emission rates are caluculated
347/348		test stands	summary emission						yes	160,220	lb/yr	1982 data; 85% removal efficiency (emissions controls)
		Jet engine test cells	JP-4				PA			9,826	lb/yr	1982 data; 1368 engines tested in 1982; various types
							CO			162,681	lb/yr	1982 data
							HC			42,290	lb/yr	1982 data
							SOX			10,450	lb/yr	1982 data
							NOX			85,041	lb/yr	1982 data
347		electrical repair area	personal sampling				Perc			40	mg/m3	1984 data; air sampling
							Perc			1	mg/m3	1984 data; air sampling
348		parts cleaning area	general usage	see note 1	55	gal/mo						Unknown
348	7	plating and cleaning engine parts	area sample				Perc		no	8.50	tons/yr	1986 data
348	7	Degreaser	perc							8.50	tons/yr	1987 data
348	8	electric drying oven	Unknown							3.78	tons/yr	1987 data
	11	test stand	Unknown							1.13	tons/yr	1987 data
	12	test stand	Unknown							1.13	tons/yr	1987 data
	13	test stand	Unknown							0.03	tons/yr	1987 data
	14	test stand	Unknown							0.03	tons/yr	1987 data
	15	test stand	Unknown							0.03	tons/yr	1987 data
	17	test stand	Unknown							0.05	tons/yr	1987 data
	18	test stand	Unknown							0.05	tons/yr	1987 data
	21	test stand	Unknown							0.05	tons/yr	1987 data
	22	test stand	Unknown							0.05	tons/yr	1987 data
	23	test stand	Unknown							1.13	tons/yr	1987 data
348	9	Vapor Blast	Unknown							55.00	tons/yr	1987 data
348	7	Degreaser	perc							8.50	tons/yr	1986 data; emission rates are caluculated
	8	electric drying oven	Unknown							3.78	tons/yr	1986 data; emission rates are caluculated
	11	test stand	Unknown							1.13	tons/yr	1986 data; emission rates are caluculated
	12	test stand	Unknown							1.13	tons/yr	1986 data; emission rates are caluculated
	13	test stand	Unknown							0.03	tons/yr	1986 data; emission rates are caluculated
	14	test stand	Unknown							0.03	tons/yr	1986 data; emission rates are caluculated
	15	test stand	Unknown							0.03	tons/yr	1986 data; emission rates are caluculated

Bldg #	Emis Pt #	Description	Material Used	Percentage	Amount Used or Time Run	Unit	Pollutant	Emission Factor	Controls Used	Estimated Emissions	UNITS	Comments
	17	test stand	Unknown							0.05	tons/yr	1986 data; emission rates are caluculated
	18	test stand	Unknown							0.05	tons/yr	1986 data; emission rates are caluculated
	20	Degreaser	Unknown/Assumed perc							55.00	tons/yr	1986 data; emission rates are caluculated
	21	test stand	Unknown							0.05	tons/yr	1986 data; emission rates are caluculated
	22	test stand	Unknown							0.05	tons/yr	1986 data; emission rates are caluculated
	23	test stand	Unknown							1.13	tons/yr	1986 data; emission rates are caluculated
348	115	Carbon Absorption Unit	Unknown							1.80	lbs/hr	1986 data; emission rates are caluculated
360	65	Degreaser	perc							32.40	tons/yr	1987 data
360	70	Paint Shop	Unknown/Assumed perc							15.00	tons/yr	1987 data
360	62	Chemical Cleaning	Unknown							0.02	tons/yr	1987 data
	63	Chemical Cleaning	Unknown							0.05	tons/yr	1987 data
	64	Chemical Cleaning	Unknown							0.01	tons/yr	1987 data
360	65	Degreaser	perc							32.40	tons/yr	1986 data; emission rates are caluculated
360	70	Paint Shop	Unknown							15.00	tons/yr	1986 data; emission rates are caluculated
361	96	Paint Facility	Unknown/Assumed perc							5.92	tons/yr	1987 data
361	96	Paint Facility	Unknown							5.92	tons/yr	1986 data; emission rates are caluculated
365		Paint shop hangar	area sampling				MC			164.5	mg/m3	1986 data
			area sampling				Chromates			0.104	mg/m3	1986 data
			area sampling				Toluene			44	mg/m3	1986 data
			area sampling				MEK			190	mg/m3	1986 data
			area sampling				Perc			2.651	mg/m3	1986 data
			area sampling				Perc			0.286	mg/m3	1986 data
			area sampling				Perc			0.209	mg/m3	1986 data
			area sampling				MEK			0.14	mg/m3	1986 data
			area sampling				MEK			0.26	mg/m3	1986 data
			area sampling				MEK			0.039	mg/m3	1986 data
			area sampling				MEK			0.252	mg/m3	1986 data
			area sampling				MEK			0.077	mg/m3	1986 data
365	24	Aircraft Painting	area sample				MC		yes	260.00	tons/yr	1987 data
			area sample				MEK		yes	41.00	tons/yr	
365	24	Paint	Unknown							324.00	tons/yr	1987 data
365			Unknown	See note 1	66000	gal	stripper					1985 Data
			Unknown	See note 1	6600	gal	MEK					1985 Data
365	24	Paint	Unknown							324.00	tons/yr	1986 data; emission rates are caluculated
366	97	Paint Facility	Unknown/Assumed perc							8.29	tons/yr	1987 data
366	97	Paint Facility	Unknown							8.29	tons/yr	1986 data; emission rates are caluculated
375		General usage	MEK	See note 1	10	gal/mo	MEK					1988 data; general usage
			Corr. Resist. Coating	See note 1	13.5	gal/mo	chromic acid					1988 data; general usage
			rubber base adhesive	See note 1	1	gal/mo	MEK					1988 data; general usage
			primer	See note 1	1	gal/mo	MC					1988 data; general usage
			primer	See note 1	1	gal/mo	toluene					1988 data; general usage

Bldg #	Emis Pt #	Description	Material Used	Percentage	Amount Used or Time Run	Unit	Pollutant	Emission Factor	Controls Used	Estimated Emissions	UNITS	Comments
375		General usage	degreaser	See note 1	22.5	gal/mo	perc					1988 data; general usage
375		welding shop	MEK	See note 1	3	gal/mo	MEK					1982 data
375		welding shop	paint/primer	See note 1	5	gal/mo	toluene					1989 data; component of paint
			paint/primer	See note 1	3.5	gal/mo	MEK					1989 data
			paint/primer	See note 1	3	gal/mo	MEK					1989 data
			paint/primer	See note 1	1	gal/mo	MEK					1989 data
			paint/primer	See note 1	1	gal/mo	MEK					1989 data
			paint/primer	See note 1	1	gal/mo	MEK					1989 data
			paint/primer	See note 1	0.5	gal/mo	MEK					1989 data
			paint/primer	See note 1	13.95	gal/mo	MEK					1989 data
			paint/primer	See note 1	1.55	gal/mo	toluene					1989 data
			paint/primer	See note 1	1	gal/mo	MEK					1989 data
			paint/primer	See note 1	0.5	gal/mo	MC					1989 data
			paint/primer	See note 1	2	gal/mo	toluene					1989 data
			paint/primer	See note 1	12	gal/mo	toluene					1989 data
			paint/primer	See note 1	0.5	gal/mo	toluene					1989 data
			paint/primer	See note 1	6	gal/mo	MEK					1989 data
			paint/primer	See note 1	6	gal/mo	toluene					1989 data
			paint/primer	See note 1	2	gal/mo	MEK					1989 data
375	26	Aircraft Parts Painting	area sample				MEK		no	3.80	tons/yr	1987 data
	27	Stripping/Cleaning	area sample				MEK		no	4.00	tons/yr	1987 data
375	26	Paint Facility	Unknown							22.07	tons/yr	1987 data
375	27	Paint Phenols	Unknown							19.00	tons/yr	1987 data
375	111	Purging Fluid Tank	Unknown							92.00	tons/yr	1987 data
	112	Purging Fluid Tank	Unknown							92.00	tons/yr	1987 data
	113	Purging Fluid Tank	Unknown							92.00	tons/yr	1987 data
	114	Purging Fluid Tank	Unknown							92.00	tons/yr	1987 data
375	26	Paint Facility	Unknown							22.07	tons/yr	1986 data; emission rates are caluculated
375	111	Purging Fluid Tank	Unknown							92.00	tons/yr	1986 data; emission rates are caluculated
	112	Purging Fluid Tank	Unknown							92.00	tons/yr	1986 data; emission rates are caluculated
	113	Purging Fluid Tank	Unknown							92.00	tons/yr	1986 data; emission rates are caluculated
	114	Purging Fluid Tank	Unknown							92.00	tons/yr	1986 data; emission rates are caluculated
385	50	Paint Stripping	Unknown/Assumed MEK							51.00	tons/yr	1987 data
Unknown		Stack emissions	Unknown		8.80	lbs/yr	Hex Chrome					1985 data
			Unknown		60,000.00	lbs/yr	Perc					1985 data
Unknown		general emission calcs	Unknown				MEK	100		179,510	lb/yr	1982 data
Unknown		general emission calcs	Unknown				perc	25		507,992	lb/yr	1982 data
Unknown		general emission calcs	Unknown				toluene	100		15,552	lb/yr	1982 data
Unknown		general emission calcs	Unknown				stripper (M	100		238,291	lb/yr	1982 data
385	50	Paint Stripping	area sample				MEK		no	17.00	tons/yr	1987 data
385	50	Paint Stripping	Unknown							51.00	tons/yr	1986 data; emission rates are caluculated
647		General usage	paint	See note 1	3.6	gal/mo	toluene					1989 data

Bldg #	Emis Pt #	Description	Material Used	Percentage	Amount Used or Time Run	Unit	Pollutant	Emission Factor	Controls Used	Estimated Emissions	UNITS	Comments
645		Zinc Chromate Painting	paint/primer				chromate			0.094	mg/m3	1987 data; TWA; worst case scenario (doors closed)
			paint/primer				chromate			0.035	mg/m3	1987 data; TWA; worst case scenario (doors closed)
			paint/primer	See note 1	3	gal/yr	MEK					1987 data
920	56	Solvent Tank	Unknown/Assumed perc							0.30	tons/yr	1987 data
920	56	Solvent Tank	Unknown							0.30	tons/yr	1986 data; emission rates are caluculated
2028		General usage	paint/primer	See note 1	<2	gal/mo	Toluene					1986 data
			paint/primer	See note 1	<2	gal/mo	MEK					1986 data
3820		Air samples	paint booth				Chromium			0.059	mg/m3	1980 data
Unknown			Unknown	See note 1	65000	gal	perc					1985 Data
Unknown			Unknown	See note 1	20000	gal	MEK					1985 Data
Unknown			Unknown	See note 1	142510	gal	stripper					1985 Data
Unknown			Unknown	See note 1	17500	gal	carbon remover					1985 Data

Bldg #	Emis Pt #	Description	Material Used	Percentage	Amount Used or Time Run	Unit	Specific Gravity	Fuel Flow (lbs/1000 lbs)	Density (lb/gal)	Pollutant	Emission Factor	Controls Used	Estimated Emissions	UNITS	Estimated Emissions (tpy)	UNITS	Comments
259		general room concentration	area sample							Perc			>30	mg/m3	>30	mg/m3	1976 data
259		Chrome mist fallout	area sample							chromic acid			0.0415	mg/m3	0.0415	mg/m3	1975 data from stack emission
258		Chromic acid measurements	area sample							chromic acid			.004-.007	mg/m3	.004-.007	mg/m3	1976 data
		Chromium measurements	area sample							chrome			.001-.026	mg/m3	.001-.026	mg/m3	1976 data
348	9	Repair/Test shop	area sample							perc		yes	12.00	lbs/day	1.56	T/Yr	1978 Data
365		Cleaning C5 with MEK	MEK							MEK			211	mg/m3	211	mg/m3	1973 data
			MEK							MEK			13	mg/m3	13	mg/m3	1973 data
			MEK							MEK			147	mg/m3	147	mg/m3	1973 data
			MEK							MEK			90	mg/m3	90	mg/m3	1973 data
			MEK							MEK			36	mg/m3	36	mg/m3	1973 data
1420		Special Weapons	explosive testing							Chromium			1.2	mg/m3	1.2	mg/m3	1971 data; area sample
3020		area air sample	sermatel operation							chromates			0.002	mg/m3	0.002	mg/m3	1973 data
			sermatel operation							chromates			0.004	mg/m3	0.004	mg/m3	1973 data
Unknown		Radome stripping	unknown							MEK			46.00	mg/m3	46.00	mg/m3	1979 data
			unknown							MEK			110.00	mg/m3	110.00	mg/m3	1979 data
			unknown							MEK			16.00	mg/m3	16.00	mg/m3	1979 data
			unknown							MEK			10.00	mg/m3	10.00	mg/m3	1979 data
Unknown		Chromic acid	product	See note 1	3000	gal/mo				chrome							1973 data

Engine Running Time

Engine	Fuel Type	Mins. per Test
T-56	JP-4	105
J-79	JP-4	145
TF-39	JP-4	150
GTCP85 180	JP-4	19
GTCP85 70A	JP-4	51
GTCP85 71A	JP-4	101
GTCP85 106A	JP-4	18
GTCP85 397	JP-4	16
GTCP85 9A	av gas	155
GTCP85 15	JP-4	23
T41M8	JP-4	101
T41M 9A	JP-4	146
GTCP 165-1	JP-4	21
T62T32	JP-4	40
	Total mins	1091

Source: 1975 Memo. Air Pollution Emissions from Air Force Engine Test Facilities

Total Test Time

77.92857143 Avg mins per test
1368 Tests conducted in 1982
106606.2857 Total mins testing in 1982

Bldg #	Emis Pt #	Description	Material Used	Percentage	Amount Used or Time Run	Unit	Specific Gravity	Fuel Flow (lbs/hr)	Density (lb/gal)	Pollutant	Emission Factor	Controls Used	Estimated Emissions (tpy)	Comments
c	Unknown	T-56 Test Cell	JP-4	N/A	106606	min	N/A	0.724	N/A	Benzene	0.00478	None	0.18369	Used emission factors provided in 1999 AEI Guidance document for the T-56-A7 engine
					106606	min		0.724		Ethylbenzene	0.00062	None	0.02383	
					106606	min		0.724		Formaldehyde	0.0411	None	1.58611	
					106606	min		0.724		MEK	0.0013	None	0.05017	
					106606	min		0.724		Toluene	0.00271	None	0.10458	
					106606	min		0.724		m,p Xylene	0.00031	None	0.01196	
					106606	min		0.724		o Xylene	0.00032	None	0.01235	No emission factor for idle. Used approach emission factor.

Sources: 1975 Memo. Air Pollution Emissions from Air Force Engine Test Facilities and 1982 Air Pollution Emissions Inventory

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Input Value Calculations

	Input Value is mg/m3	Input Value in Tons/yr	Input Value in gal/mo	Input Value in lb/mo	Assumption
Perchloroethylene	0.000007775 T/yr	0.25	0.020229	0.0015	Assume 25% volatilization
Chromic Acid	0.000007775 T/yr	0.025	0.003374	0.00015	Assume 2.5% overspray
MEK	0.000007775 T/yr	1	0.040484	0.006	Assume 100% volatilization
Methylene Chloride	0.000007775 T/yr	1	0.066473	0.006	Assume 100% volatilization
Ethyl Benzene	0.000007775 T/yr	1	0.041628	0.006	Assume 100% volatilization
Toluene	0.000007775 T/yr	1	0.041568	0.006	Assume 100% volatilization

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